

# Evaluation of warm season turfgrasses for putting green in two locations in Italy

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## Introduction

The Mediterranean climatic area is considered transition zone for turfgrasses and both cool season and warm season turfgrasses can be grown. However, during summer months' heat stress, irrigation requirements, disease pressure and traffic effects may cause a significant decline in quality of cool season stands. In this area warm season turfgrasses are recognized as having an easier, less expensive and more environmentally friendly management and this leads to an increasing use of these turfgrasses for golf courses and other sports surfaces<sup>1</sup>. Intensive maintenance regimes on golf greens pose additional stress to plants thus making warm season turfgrasses the most promising tool for quality putting surfaces in the transition zone<sup>2</sup>. Hybrid bermudagrass (*Cynodon dactylon* x *transvaalensis* Burt-Davy) is widely used on putting greens in the transition zones of the United States and particular skills are required to properly manage the so called ultradwarf cultivars<sup>3,4</sup>. Other species like seashore paspalum (*Paspalum vaginatum* Swartz) and manilagrass (*Zoysia matrella* [L.] Merr.) are only occasionally used on greens, however their relative importance may

change in the future due to the current trends towards low input turfgrass management. Warm season turfgrasses for golf putting greens are not yet popular in Italy and comparative evaluation trials may provide the golf industry with a screening of adaptation characteristics and quality performances.

## Methods

Two field trials were carried out from 2015 to 2017 in two locations in Italy: Bagnaia (Royal Golf La Bagnaia – 43°13'30" N; 11°17'26" E – Central Italy) and Solbiate Olona (Le Robinie Golf Club – 45°38'24" N; 8°51'40" E – Northern Italy). The following six turfgrass cultivars were established: Champion, Miniverde, TifEagle and Tifdwarf hybrid bermudagrass, Seadwarf seashore paspalum and Diamond manilagrass. Cultivars were propagated as sprigs in plastic trays, grown in the green house until roots and leaf were completely developed and shipped to the trial locations for transplant as small plugs. At both sites trial areas were located on a sand-over-soil profile in order to mimic putting green soil conditions. Plots 2.5 m long and 1.5 m wide were arranged in randomized blocks with three replication and plugs were

transplanted at a density of 27.7 plugs m<sup>-2</sup>. Transplant was accomplished on 15 July 2015 in Bagnaia and the following day in Solbiate Olona. Each year 300 kg ha<sup>-1</sup> of N, 80 kg ha<sup>-1</sup> of P and 200 kg ha<sup>-1</sup> of K were applied from April to September. In 2015 irrigation was applied to encourage establishment and to compensate evapotranspiration in the following years. Mowing was performed with a reel mower and gradually brought to 4 mm as standard height of cut for golf greens. Sand top dressings were carried out every other week during establishment in order to obtain an even surface. In order to avoid cross contamination 40 cm bare ground alleyways were maintained between plots. Turfs were visually assessed once a month to determine ground cover, turf quality and spring green up. Assessments are reported as percentage for ground cover and as score on 1-9 rating scale for quality and spring green up. Data were subject to ANOVA with the two locations analyzed separately and according to a complete randomized block experimental design for each location. Least significant difference (LSD) for P≤0.05 was calculated to separate means. Results are reported in table 1 and table 2 for Bagnaia and Solbiate Olona respectively.

Species	Cultivar	Ground cover (%)		Green Up (1-9)		Quality (1-9)		
		29 Aug 2015	23 Jun 2016	06 Apr 2016	03 Apr 2017	24 Aug 2016	12 Oct 2016	24 Aug 2017
Cd x t <sup>1</sup>	Champion	55	96	6.0	5.5	7.7	8.8	6.7
Cd x t	Miniverde	67	92	4.8	6.8	8.7	8.2	7.8
Cd x t	Tifdwarf	57	90	4.5	6.8	6.5	7.2	6.5
Cd x t	TifEagle	62	93	5.8	6.8	7.3	8.5	7.3
Pv <sup>2</sup>	Seadwarf	68	100	7.0	7.3	8.0	7.8	7.0
Zm <sup>3</sup>	Diamond	23	82	7.8	9.0	5.5	7.2	8.5
	LSD 0.05 <sup>4</sup>	9	7	1.0	0.8	0.9	1.0	0.6

<sup>1</sup> *Cynodon dactylon* x *transvaalensis*; <sup>2</sup> *Paspalum vaginatum*; <sup>3</sup> *Zoysia matrella*; <sup>4</sup> Least Significant Difference at 0.05 probability level

Table 1: Bagnaia: ground cover percentage (%), green up (1-9 rating scale with 1 = straw brown and 9 = dark green) and quality (1-9 rating scale with 1 = poor and 9 = best) of six green type turfgrasses determined at different dates.

Species	Cultivar	Ground cover (%)		Green Up (1-9)		Quality (1-9)		
		01 Sep 2015	16 Jun 2016	06 Apr 2016	10 Apr 2017	26 Aug 2016	07 Oct 2016	23 Aug 2017
Cd x t <sup>1</sup>	Champion	90	100	8.2	8.0	8.0	7.3	8.1
Cd x t	Miniverde	92	100	8.2	8.1	8.5	8.3	8.1
Cd x t	Tifdwarf	88	100	7.8	7.9	8.3	8.0	7.9
Cd x t	TifEagle	90	100	7.5	7.6	8.5	8.8	8.3
Pv <sup>2</sup>	Seadwarf	93	100	7.0	7.2	7.8	7.3	7.5
Zm <sup>3</sup>	Diamond	42	87	6.7	6.9	8.2	8.5	8.8
	LSD 0.05 <sup>4</sup>	7	4	0.4	0.5	0.4	0.6	0.4

<sup>1</sup> *Cynodon dactylon* x *transvaalensis*; <sup>2</sup> *Paspalum vaginatum*; <sup>3</sup> *Zoysia matrella*; <sup>4</sup> Least Significant Difference at 0.05 probability level

**Table 2: Solbiate Olona: ground cover percentage (%), green up (1-9 rating scale with 1 = straw brown and 9 = dark green) and quality (1-9 rating scale with 1 = poor and 9 = best) of six green type turfgrasses determined at different dates.**

## Results

In both locations entries did not reach the complete ground cover at the end of the 2015 growing season (tab. 1 and 2) probably due a relatively late transplanting. In Bagnaia Seadwarf and Miniverde yielded the highest ground cover (68 and 67 %). Tifdwarf and Champion had an intermediate rate of lateral spread while Diamond was the slowest with only 23 % ground cover being observed. In Solbiate Olona hybrid bermudagrasses and seashore paspalum had the same rate of lateral spread over the observation period with an average value of 90.6 % ground cover. Diamond was again the slowest to establish with only 42 % of surface being covered by the turf. The following year Seadwarf was the first cultivar to complete establishment in Bagnaia on 23 June. On the same date Champion gave a non statistically different result and most of the cultivars had reached values above 90%. Diamond reached only 82% ground cover. Bermudagrass and seashore paspalum cultivars completed their establishment by June of the second year in Solbiate Olona while Diamond was again the only cultivar to give an incomplete ground cover.

Best green up performances were recorded in Bagnaia for Diamond and

Seadwarf both in 2016 and 2017. Champion was the slowest to recover green color in 2017. In Solbiate Olona Champion and Miniverde had the fastest green up in both years with Seadwarf and Diamond having the lowest. In 2017 Tifdwarf green up was not statistically different from that of cultivars that had the highest scores while TifEagle was not statistically different from Seadwarf.

Turf quality of Miniverde was the best in August 2016 in Bagnaia and Seadwarf score did not differ statistically. Diamond did not reach an acceptable quality. The quality assessment carried out in October 2016 confirmed Miniverde as one of the top ranking cultivars together with Champion and TifEagle. In August 2017 the best quality was instead recorded on Diamond with Miniverde ranking second.

In Solbiate Olona Miniverde, TifEagle, Tifdwarf and Diamond had the best quality in August 2016 (8.5, 8.5, 8.3 and 8.2 respectively) and Seadwarf the lowest value despite receiving a fair to good score (7.8). Miniverde, TifEagle, and Diamond still had the highest quality scores in October 2016 and, similarly, Seadwarf had the lowest. Champion had the same score of Seadwarf. Quality assessed in August 2017 was in general good to high with scores

ranging between 8.8 (Diamond) and 7.5 (Seadwarf).

Hybrid bermudagrasses and seashore paspalum gave different results in the two locations but in general all cultivars confirmed a good ability to thrive under Italian summer conditions. Manila-grass reached the best quality in both locations being however the slowest to establish.

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