



Performance of bermudagrass cultivars under
different shade, irrigation, and wear treatments.

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SUMMARY

A trial was completed at STRI's Redlands research facility on several cultivars of bermudagrass (couchgrasses).

The objectives of this trial were as follows:

1. To determine the shade tolerance of TifTuf compared to Australian industry standard cultivars.
2. To determine the effect of irrigation on TifTuf compared to Australian industry standard cultivars.
3. To determine the wear tolerance of TifTuf compared to Australian industry standard cultivars.

Shade was the first stress applied from May and continued throughout the whole trial period. Differential irrigation treatments were initiated in the middle of May, creating a second stress on the grass. In addition, wear was imposed in three periods: May to early July, late July to August, and October to November. These wear periods were interspersed with periods without wear to allow grass recovery. Data were analysed to determine the overall effect of cultivars (averaged over shade, irrigation, and wear), cultivar x shade interactions (averaged over irrigation and wear), cultivar x irrigation interactions (averaged over shade and wear) and cultivar x wear interactions (averaged over shade and irrigation).

When averaged over shade, irrigation, and wear treatment, TifTuf were always among cultivars with the darkest green colour, best turf quality, densest ground cover and highest NDVI. During prolonged drought stress, TifTuf had much better performance (colour, quality, ground cover, NDVI, drought symptoms) than any other cultivar due to its superior drought tolerance.

In terms of shade tolerance, TifTuf was able to maintain the best performance among all cultivars under both 60% shade and full sun. Shade treatment reduced the colour, quality, ground cover and NDVI of all cultivars when there was no drought stress. However, shade slowed down the water loss during drought stress and led to better performance of cultivars. Greater differences between TifTuf and other cultivars were observed under 60% shade during drought period due to the superior drought and shade tolerance of TifTuf. In terms of irrigation, the performance of TifTuf was better under standard irrigation (100% ET) compared to drought conditions. However, regardless of the irrigation rate, TifTuf produced statistically better turf colour, turf quality, ground cover, NDVI and less drought symptoms compared to other cultivars.

In terms of wear, TifTuf was among the cultivars with better wear tolerance throughout the trial. Due to its superior drought tolerance, TifTuf was more tolerant to wear than any other cultivars when there was a prolonged drought stress.

TREATMENTS

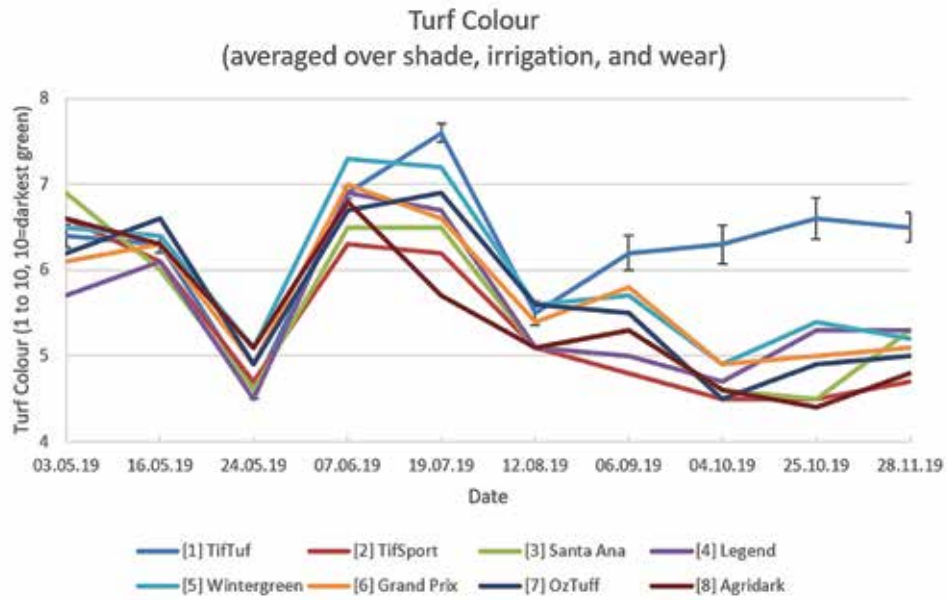
Table 1. Turfgrass cultivars and respective scientific names.

CULTIVAR	GRASS SPECIES
TifTuf	Cynodon dactylon x Cynodon transvaalensis
TifSport	
Santa Ana	
Legend	Cynodon dactylon
Wintergreen	
Grand Prix	
OzTuff	
Agridark	



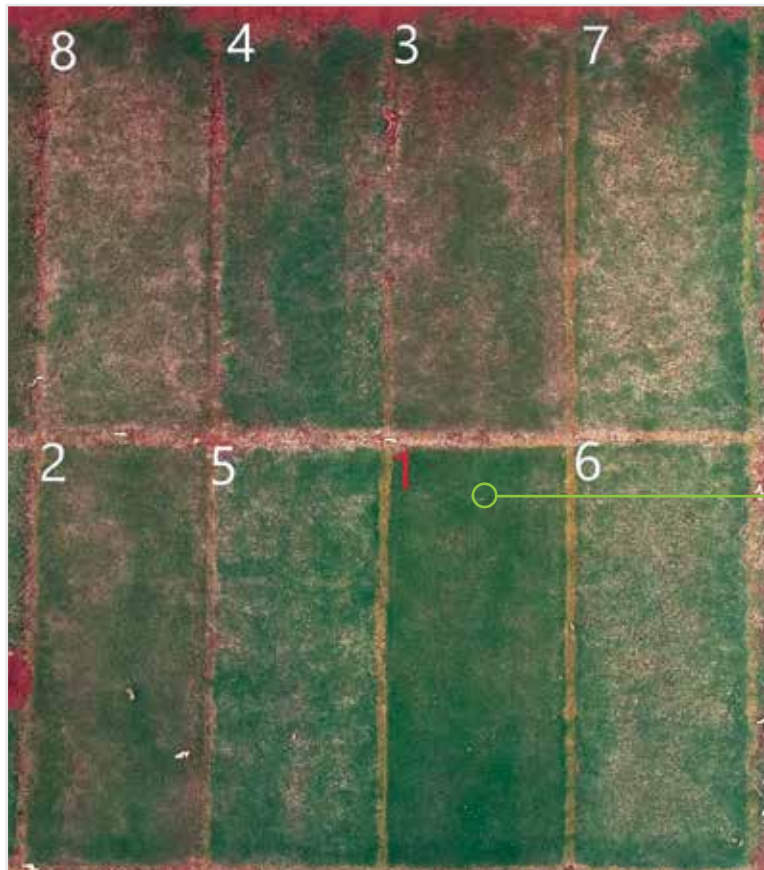
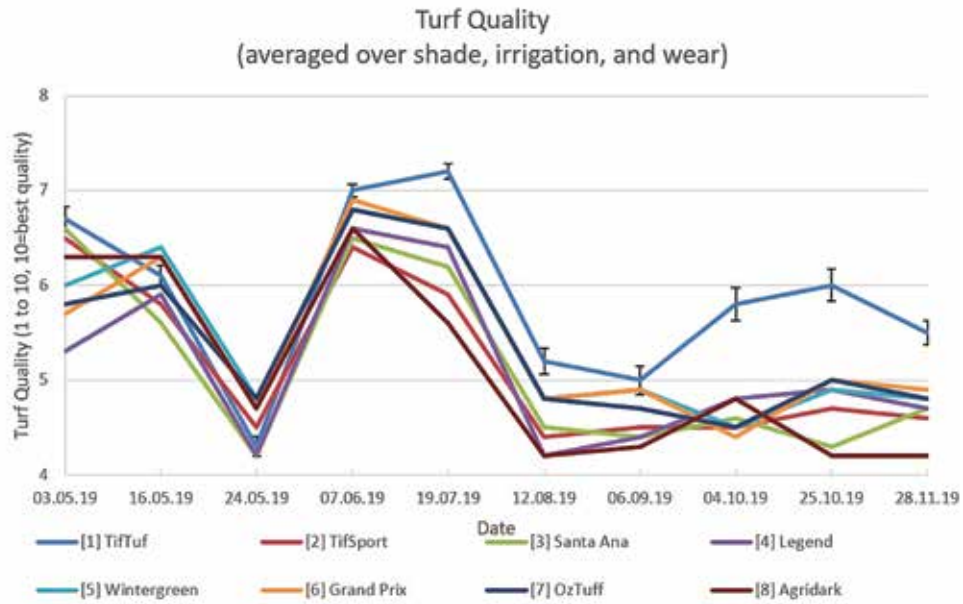
RESULTS

Figure 1. Turf colour of different cultivars averaged over the effects of shade, irrigation, and wear (the error bars on TifTuf line represent the LSD for that assessment date).



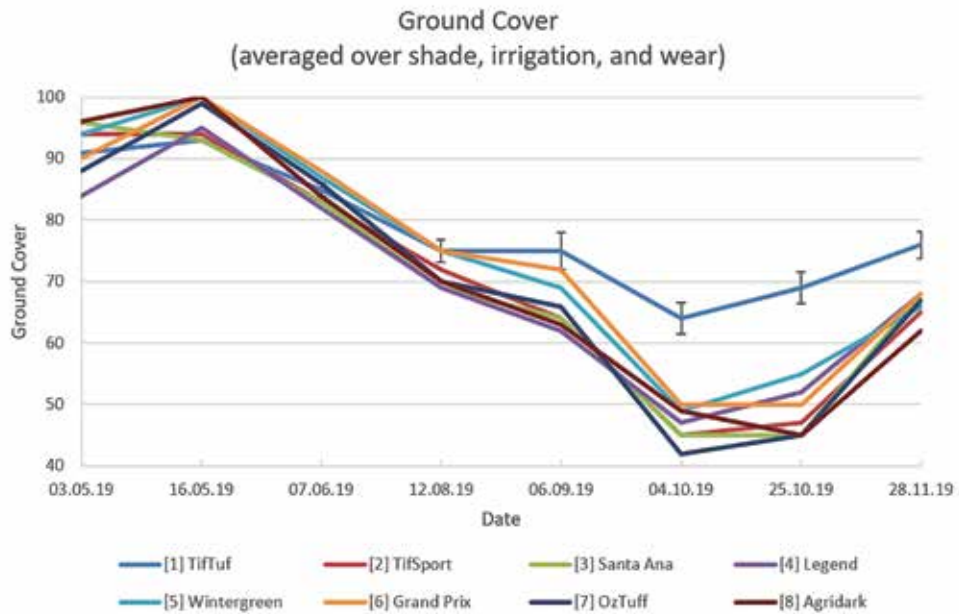
TURF QUALITY

Figure 2. Turf quality of different cultivars averaged over the effects of shade, irrigation, and wear (the error bars on TifTuf line represent the LSD for that assessment date).



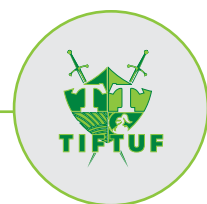
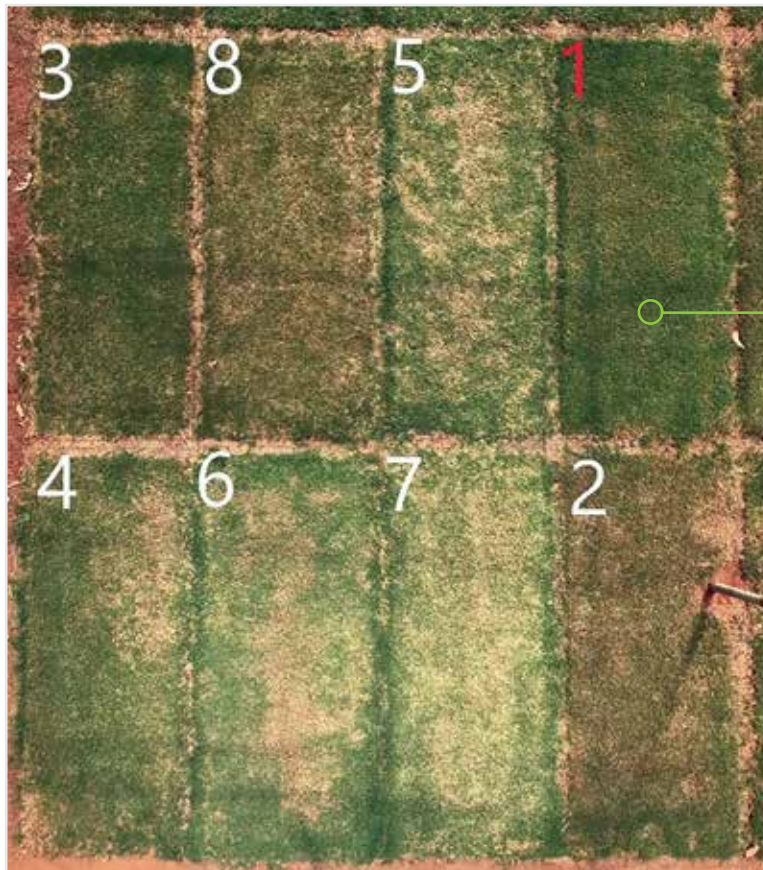
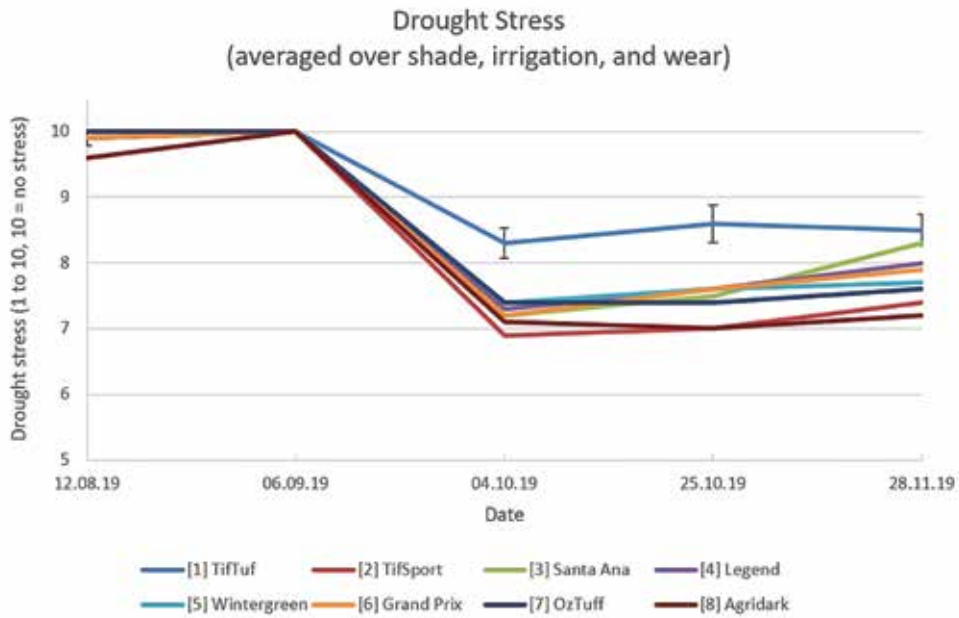
GROUND COVER

Figure 3. Ground cover of different cultivars averaged over the effects of shade, irrigation, and wear (the error bars on TifTuf line represent the LSD for that assessment date).



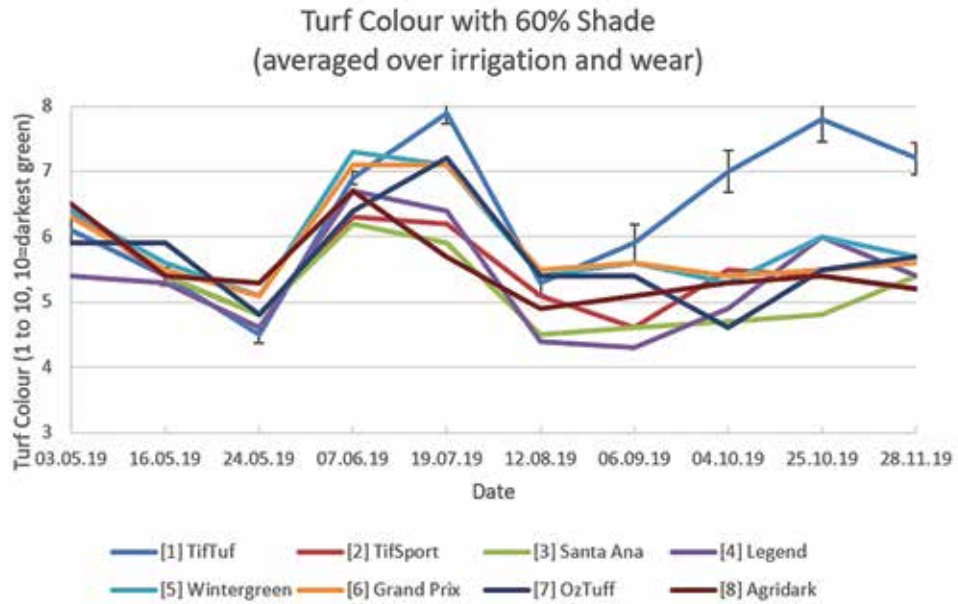
DROUGHT

Figure 6. Drought stress of different cultivars averaged over the effects of shade, irrigation, and wear (the error bars on TifTuf line represent the LSD for that assessment date).



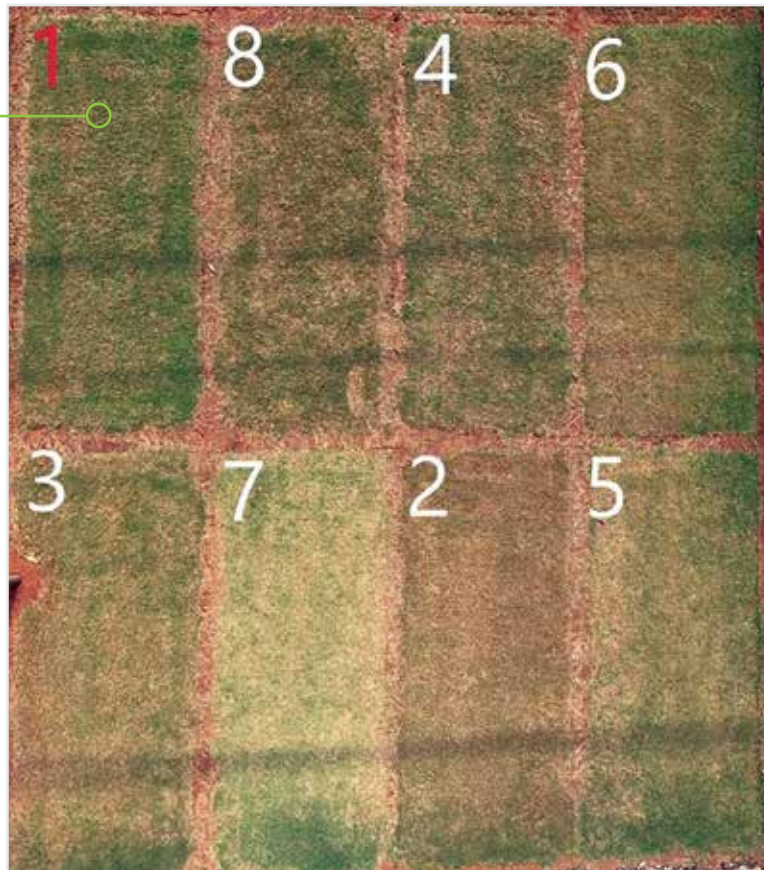
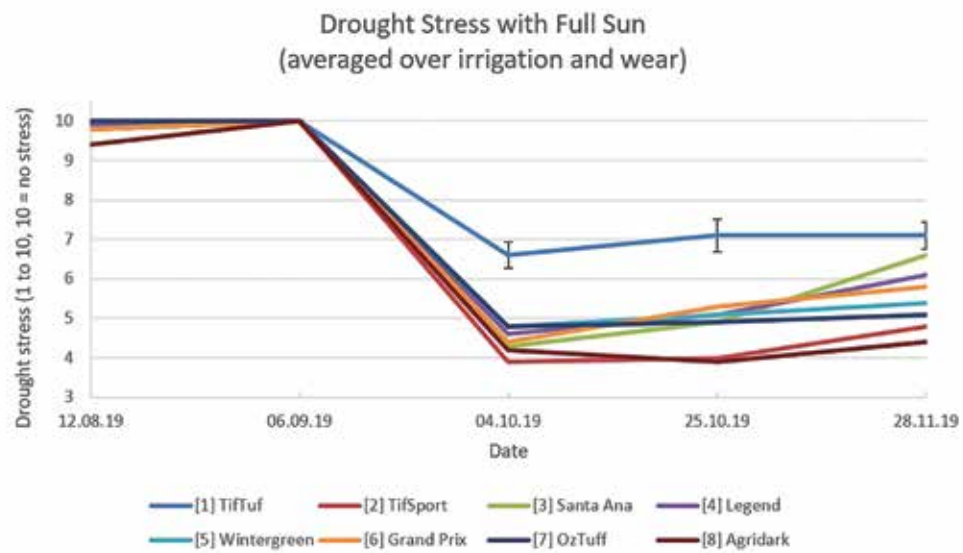
TURF COLOUR

Figure 7a: Turf colour of different cultivars under 60% shade averaged over the effects of irrigation and wear (the error bars on TifTuf line represent the LSD for that assessment date).



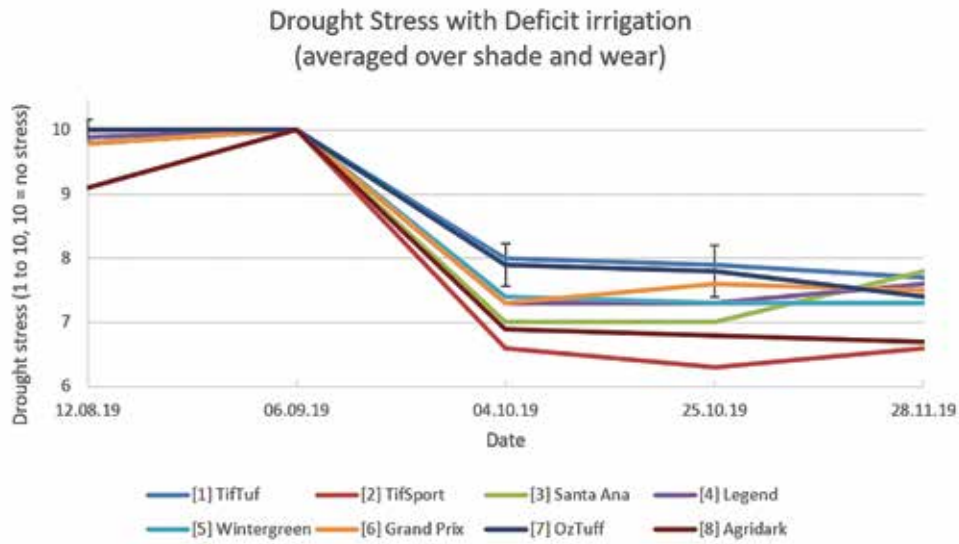
DROUGHT STRESS WITH FULL SUN

Figure 12. Drought stress of different cultivars under full sun condition averaged over the effects of irrigation and wear (the error bars on TifTuf line represent the LSD for that assessment date).



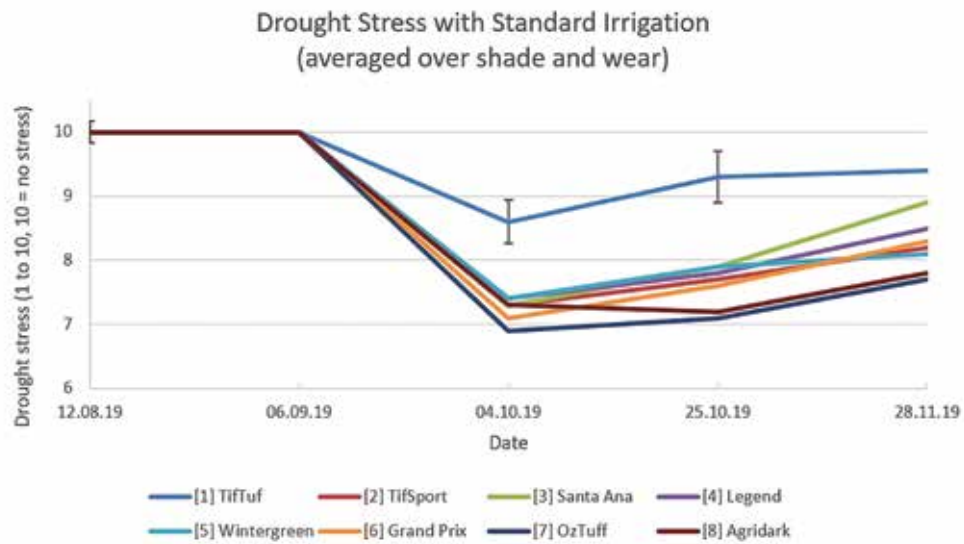
DROUGHT STRESS WITH DEFICIT IRRIGATION

Figure 18a. Drought stress of different cultivars under deficit irrigation averaged over the effects of shade and wear (the error bars on TifTuf line represent the LSD for that assessment date).



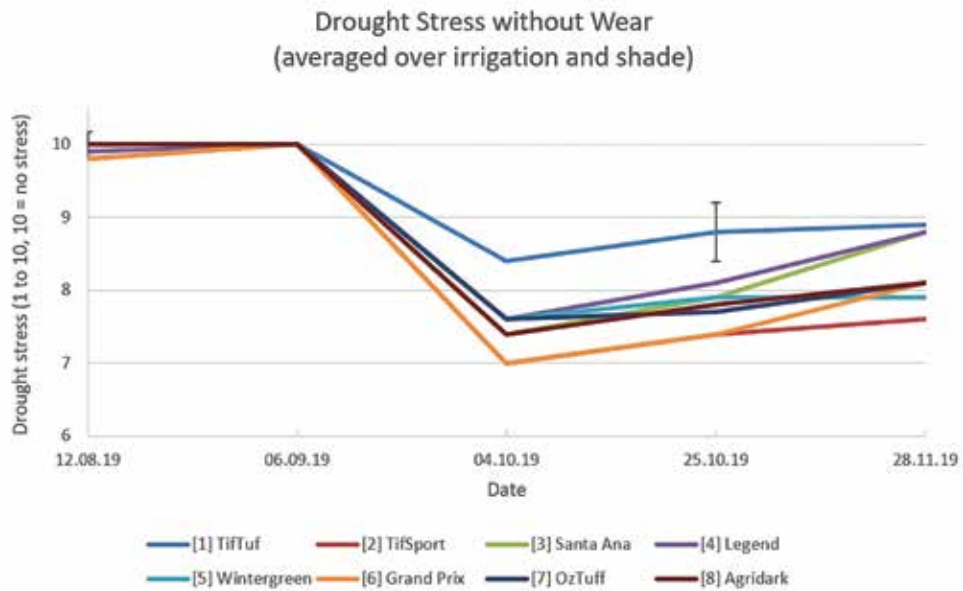
DROUGHT STRESS WITH STANDARD IRRIGATION

Figure 18b. Drought stress of different cultivars under standard irrigation averaged over the effects of shade and wear (the error bars on TifTuf line represent the LSD for that assessment date).



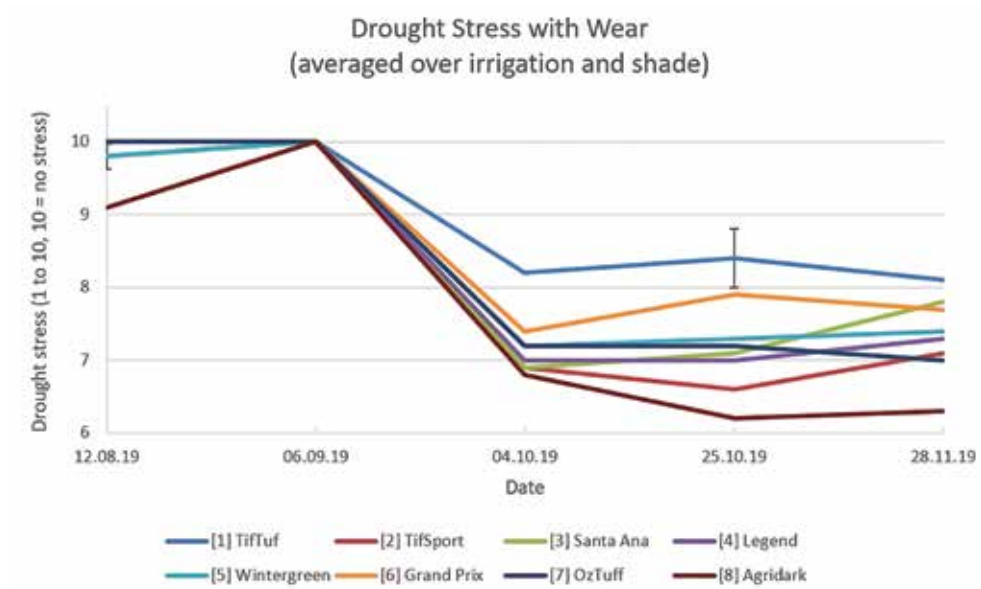
DROUGHT STRESS WITHOUT WEAR

Figure 24a. Drought stress of different cultivars without wear averaged over the effects of shade and irrigation (the error bars on TifTuf line represent the LSD for that assessment date).



DROUGHT STRESS WITH WEAR

Figure 24b. Drought stress of different cultivars with wear averaged over the effects of shade and irrigation (the error bars on TifTuf line represent the LSD for that assessment date).



TURF COVER & VIGOUR

Table 5. NDVI (greater value represents denser and more vigorous turf) of different grasses averaged by shade, irrigation, and wear treatments.

CULTIVAR	03.05.19	16.05.19	24.05.19	07.06.19	19.07.19	12.08.19	06.09.19	04.10.19	25.10.19	28.11.19
[1] TifTuf	0.69	0.62	0.50	0.52	0.56	0.49	0.52	0.53	0.63	0.55
[2] TifSport	0.66	0.59	0.49	0.47	0.51	0.43	0.47	0.45	0.47	0.46
[3] Santa Ana	0.69	0.58	0.51	0.50	0.50	0.44	0.46	0.45	0.47	0.48
[4] Legend	0.62	0.57	0.50	0.49	0.51	0.44	0.47	0.47	0.56	0.50
[5] Wintergreen	0.68	0.64	0.58	0.57	0.56	0.50	0.54	0.50	0.57	0.51
[6] Grand Prix	0.64	0.64	0.57	0.56	0.55	0.49	0.53	0.49	0.54	0.50
[7] OzTuff	0.64	0.64	0.56	0.53	0.56	0.50	0.52	0.47	0.53	0.49
[8] Agridark	0.69	0.65	0.54	0.52	0.47	0.42	0.44	0.48	0.47	0.43
P	<0.001	<0.001	<0.001	*	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
LSD	0.019	0.026	0.028	-	0.029	0.026	0.030	0.038	0.036	0.027
d.f.	189	189	189	189	189	189	189	189	189	189
c.v.	6.0	8.6	10.6	9.9	11.1	11.6	12.3	15.9	13.8	11.2

* Data skewed therefore statistical analysis not possible

TURF DROUGHT STRESS

Table 6. Drought stress (1-10 scale, 1 = complete discolouration to 10 = no signs of drought) of different grasses averaged by shade, irrigation, and wear treatments.

CULTIVAR	03.05.19	16.05.19	24.05.19	07.06.19	19.07.19	12.08.19	06.09.19	04.10.19	25.10.19	28.11.19
[1] TifTuf	10	10	10	10	10	9.9	10	8.3	8.6	8.5
[2] TifSport	10	10	10	10	10	9.9	10	6.9	7.0	7.4
[3] Santa Ana	10	10	10	10	10	9.9	10	7.2	7.5	8.3
[4] Legend	10	10	10	10	10	9.9	10	7.3	7.6	8.0
[5] Wintergreen	10	10	10	10	10	9.9	10	7.4	7.6	7.7
[6] Grand Prix	10	10	10	10	10	9.9	10	7.2	7.6	7.9
[7] OzTuff	10	10	10	10	10	10	10	7.4	7.4	7.6
[8] Agridark	10	10	10	10	10	9.6	10	7.1	7.0	7.2
P	†	†	†	†	†	*	†	<0.001	<0.001	<0.001
LSD	-	-	-	-	-	-	-	0.47	0.57	0.48
d.f.	189	189	189	189	189	189	189	189	189	189
c.v.	0.0	0.0	0.0	0.0	0.0	5.0	0.0	13.1	15.4	12.5

* Data skewed therefore statistical analysis not possible

† Insufficient variation for statistical analysis

WHICH GRASSES DID BETTER?

Summary of cultivar performance averaged over trial period. Turf cover refers to the cultivars thickness of growth and percentage of grass coverage. NDVI (Normalised Difference Vegetation Index) summarises appearance of green cover within each plot.



WEAR RECOVERY & DROUGHT PERIOD

TURF COVER

1) TIFTUF	69%
2) Wintergreen	55%
3) Legend	52%
4) Gran Prix	50%
5) TifSport	47%
6) Santa Ana	45%
7) OzTuff	45%
8) Agridark	45%

NDVI

1) TIFTUF	0.63
2) Wintergreen	0.57
3) Legend	0.56
4) Gran Prix	0.54
5) OzTuff	0.53
6) TifSport	0.47
7) Santa Ana	0.47
8) Agridark	0.47

All Cultivars averaged over all the treatments (Shade x Drought x Wear)

