Clipping Weights of eight turf-type perennial ryegrass cultivars in August

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Introduction

August is a key month in Australian sportsgrounds used for winter football. The accumulation of damage over the winter, and the prospect of hosting finals in September, means that growth and recovery during August is critical to maintaining turf coverage and quality. One might expect that any elite perennial ryegrass would provide good growth in August, but there are actually big differences between the cultivars. This was demonstrated in an earlier PGG Wrightson Turf winter growth rate trial (Ford, 2012). The aim of this current trial was run to quantify those differences again, this time including a wider range of cultivars (the Mediterranean cultivars Arena 1 and Colosseum High Endophyte, to compare with the Continental cultivars Soprano, Spartacus, Fiesta 4, Striker Gold, Premier 3 and SR4650).

Continental vs Mediterranean genetics

Ryegrass cultivars bred from parent material originating in the snowy winters of Continental Europe need to be winter-hardy to survive ice-encasement (frozen soil) and snow cover. They do this by shutting down growth and entering a winter dormancy. The depth of dormancy depends on how cold it gets. The breeding of turf-type perennial ryegrasses in the US (mainly in New Jersey) started out using Continental genetics, originally selected from cold parts of Europe (even Finland), and later using winter-hardy survivor plants from the north-east coast of the US (Funk & Clarke, 1989; Thorogood, 2003). Early cultivars such as Linn, Manhattan and Pennfine (all released in the 1960s) are good examples, selected for dark-green colour, fine texture, high density - and winter hardiness. Modern US-bred turf-type perennial ryegrasses continue to exploit these genetic traits.

But southern Australia has a Mediterranean climate. Our winters don't get nearly as cold as Continental Europe or the northern states of the US, and there is no need for winter-hardiness or the winter-dormancy that goes with it. In fact, those traits are counter-productive on football fields over here. For decades, the genetics of our most successful pasture ryegrasses have come from Mediterranean areas such as Spain and North Africa. These types have much higher winter growth, as well as better summer drought tolerance and improved persistence over time (Silsbury, 1960; Steward & Aberdeen, 1997). Australasian-bred turf-type perennial ryegrasses are derived mainly from that winter-active, Mediterranean germplasm. The emphasis has been on high winter growth, good persistence (enhanced by the presence of endophytes), dwarfiness and high density. There has been less emphasis on dark colour, so these cultivars have more of an 'English Green' rather than the dark, blue-green colour so popular in the US. Note: one benefit of the English Green colour is that *Poa annua* infestation is less noticeable in the sward.

It's horses for courses - research has shown that Continental cultivars are better suited to climates with extremely cold winters, including ice-encasement and snow. On the other hand, Mediterranean cultivars are better suited to climates with milder winters, where they don't need to go dormant to survive. In such climates, the Mediterranean ryegrasses have much higher winter growth, better drought tolerance and improved persistence over time. So Sportsground Managers in Australia and New Zealand have two (or three) main options when it comes to selecting perennial ryegrasses for sportsfields. If they want dark-green colour and the field only has low to moderate traffic, then a US-bred Continental type will work; as long as they realise that winter growth will be quite limited. Or, if they need a lot of winter growth they can use a Mediterranean cultivar. The third option is to use a blend of the two, and this has worked quite well – providing a darker colour, along with reasonable winter activity.

Methods

The trial was located at the PGG Wrightson Research Facility, at Leigh Creek (near Ballarat). The soil is a deep Ferrosol with excellent drainage and fertility. The trial design was a Replicated Complete Block Design with three replicates, and individual plot dimensions of 1.7m x 20m. Each plot was hand-sown on 30th April, at a rate of 4kg/100m^2, with the exception of Spartacus which was sown on 7th May. The area was fertilized at sowing with a manure-based product at a rate of 20kg/100m^2 (0.9kg actual N/100m^2). Natural rainfall over the following weeks ensured an excellent establishment. The plots were maintained with a rotary mower through May, June and July, and fertilized twice more over winter with nitrogen fertilizer at 0.5kgN/100m^2.

On 5th August and again on 26th August, clippings on each plot were harvested for weighing. The yield for 5th August was for a two week period since the previous mowing, but the yield for 26th August was for a three week period. So each clipping determination should be seen as a stand-alone comparison between the cultivars. The clippings were harvested using a pedestrian cylinder mower set at 17mm. The mower has a 650mm width of cut, and two runs of 15m long were done on each plot, with no overlap. This gave a total area of cut of 19.5m^2 per plot. The clippings were collected in a catcher equipped with a netting screen to prevent loss of material. The harvested clippings were immediately weighed (Fresh Weight), and a sample of around 300g was weighed separately, to allow a determination of Dry Matter. These samples were dried at 60^{o}C for 7 days and re-weighed to determine the Dry Matter yield.

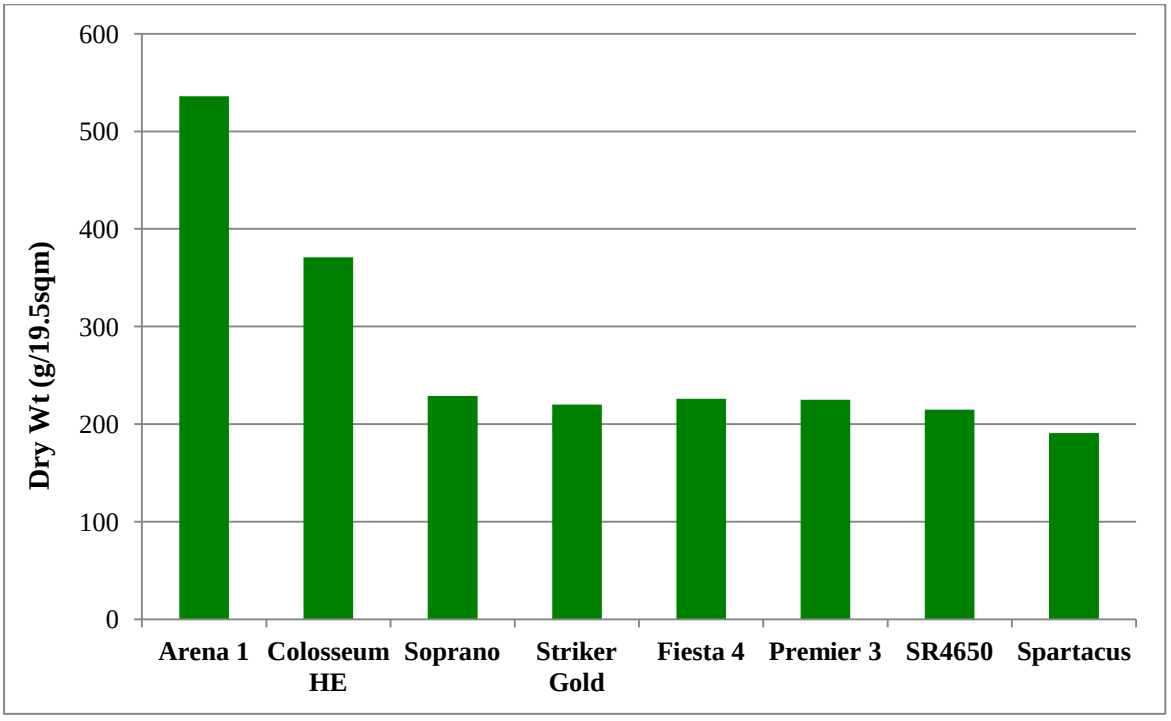
Samples from four plots were collected for tissue analysis by Incitec-Pivot's Nutrient Advantage laboratory. Fresh Weight and Dry Matter yields were analysed by ANOVA, and where significant differences between cultivars were evident, a Least Significant Difference value calculated.

Results

The tissue analysis was consistent across all four samples, showing a nitrogen concentration in the range 5 – 5.2%, and sufficient levels of all other nutrients with the exception of a slight magnesium deficiency. The Fresh Weight and Dry Matter yields are shown graphically in Graphs 1 and 2, and in Tables 1 and 2. Means with a different letter following them were significantly different, at a P level of 95%.

Mown 5/8/19	**Fresh Wt (g/19.5m^2)**	**Dry Wt (g/19.5m^2)**
Arena 1	2828 [a]	536 [a]
Colosseum HE	1924 [b]	371 [b]
Soprano	1168 [c]	229 [c]
Striker Gold	1124 [c]	220 [c]
Fiesta 4	1115 [c]	226 [c]
Premier 3	1108 [c]	225 [c]
SR4650	1046 [c]	215 [c]
Spartacus	1019 [c]	191 [c]
LSD (P = 0.05)	176	40

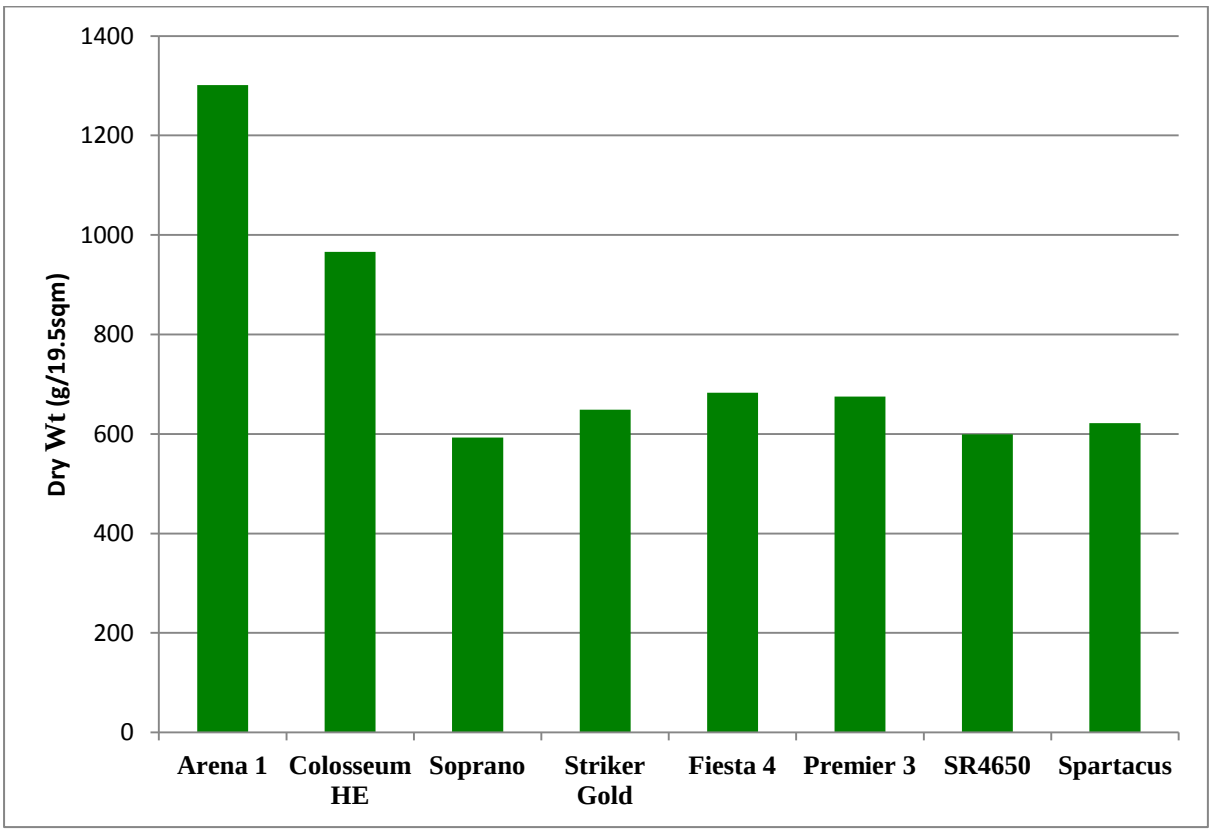
Table 1: Fresh Weight and Dry Weight yields from mowing on 5th August 2019 (19.5m^2 plots).



Graph 1: Dry Matter yield of the eight perennial ryegrass cultivars on 5th August.

Mown 26/8/19	Fresh Wt (g)	Dry Wt (g)
Arena 1	8241 [a]	1301 [a]
Colosseum HE	5769 [b]	966 [b]
Soprano	3340 [c]	593 [c]
Striker Gold	3600 [c]	649 [c]
Fiesta 4	3749 [c]	683 [c]
Premier 3	3597 [c]	675 [c]
SR4650	3234 [c]	599 [c]
Spartacus	3527 [c]	622 [c]
LSD (P = 0.05)	1631	273

Table 2: Fresh Weight and Dry Weight yields from mowing on 26th August 2019 (19.5m^2 plots).



Graph 2: Dry Matter yield of the eight perennial ryegrass cultivars on 5th August.

In summary, Arena 1 had a significantly higher clipping yield than Colosseum HE at both harvests. Colosseum HE, in turn, had a significantly higher clipping yield than the six Continental cultivars (Soprano, Striker Gold, Fiesta 4, Premier 3, SR4650 and Spartacus). There was no significant difference between the six Continental cultivars. In relative terms, on 5th August Arena 1 had 144% higher clipping production than Colosseum HE, and around 230% higher yield than the Continental cultivars. On 26th August, Arena 1 had 134% higher

yield than Colosseum HE, and 200% higher yield than the Continental cultivars. This difference is seen clearly in the freshly harvested piles from a single replicate, shown below:

Photo 1: Freshly harvested clippings from single replicates (19.5m^2 area), 26th August.

Discussion

The findings are in full agreement with the 2012 trial comparing Arena 1 and Colosseum with other Continental cultivars and blends (Ford, 2012). In the critical month of August, Arena 1 had more than double the biomass production of the Continental cultivars. This higher growth would be important for recovery and wear tolerance at the late end of the winter season, especially for grounds hosting finals in September. The trial provides reliable data to help Turf Managers in their decision-making on perennial ryegrass cultivars, whether it be for permanent ryegrass swards, or for winter oversowing of couch or kikuyu fields.

References

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