OTS HIGHLIGHT

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Rhizomatous Tall Fescue and Regenerative Perennial Ryegrass Performance in Ontario: Year 1

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Background

I think it is safe to say that with the passing of the Cosmetic Pesticides Ban it has been more challenging to manage turf. Many of the pests that either attack or infest turf are more difficult to control using a one product – one pest approach. We must really integrate all of our tools, including cultural practices, turf species selection and bio-pesticides for success. In addition, the last few growing seasons have been very dry, increasing pressure on water supplies and necessitating watering bans in many municipalities. Ideally we are looking for pest tolerant grass species that are also drought tolerant.

With that in mind we started to investigate the potential use of novel grass species that may not only be drought tolerant, but are also able to resist weed invasion and are less susceptible to insect feeding. Cue the arrival of rhizomatous tall fescue (RTF) and regenerative perennial ryegrass (RPR) into the market place. Rhizomatous tall fescue is purported to grow better in summer and late fall than tall fescues that are currently on the market. They have endophytes that are different from other tall fescues currently on the market. They require less water because of their deep roots and have rhizomes which should give them the ability to fill in on their own if the turf stand thins due to wear, pest damage or any other stress for that matter. There is an excellent article that explains the origins of rhizomatous tall fescue and how it differs from the Continental tall fescue morphotype (a morphotype is the same species but it differs significantly morphologically, genetically, physiologically and geographically) than the tall fescue that the majority of the turf varieties on the market originate. The article can be found in Sports Turf Manager, Summer 2012, Vol. 25. No. 2. In this article there are data documenting the rhizomatous habit of this morphotype as well as some information on the performance of RTF under intense traffic. RTF plus Kentucky bluegrass and Kentucky bluegrass sod performed the best in the traffic performance trials and based on this RTF/Kentucky bluegrass sod is now being produced and marketed for sports fields in Ontario.

What does regenerative perennial ryegrass have to offer that is novel? RPR is a subspecies of perennial ryegrass that produces stolons. It is also referred to as stoloniferous perennial ryegrass. Until now, the cultivars of perennial ryegrass that have been marketed in Ontario have been bunch type. In addition to having stolons, RPR was selected under intense traffic stress for its ability to survive traffic and recover. RPR also contains endophytes, which is not novel for perennial ryegrass cultivars.

There is some research information on these two novel types of grasses, but apart from some sod production of these, there is not a lot of information on them and how they perform in Ontario, especially when established from seed. My colleague and I were interested in seeing for ourselves how these species performed. Because tall fescue is supposed to be drought tolerant, we thought it would be interesting to look at RTF, RPR and a standard home lawn mix (HLM) (50% Kentucky bluegrass, 20% perennial ryegrass and 30% fine fescue) under two irrigation regimes (irrigated vs. non-irrigated).

Experiment

A plot area was worked and prepared for seeding at the Guelph Turfgrass

Institute. The experimental plots were arranged in a two by three factorial design (two irrigation regimes and three species/mixture) with four replications of each treatment. Plots measured 2 m x 2 m (4 m^2) and were seeded on September 21, 2011 using a hand held shaker. Treatments and seeding rates are as indicated in Table 1.

Table 1. Treatments and seeding rates

Treatment Number	Turf species/ mixture	Irrigation regime	Seeding rate
1	Rhizomatous tall fescue (RTF)	Irrigated	2.5 kg/100 m^2
2	Rhizomatous tall fescue (RTF)	Non-irrigated	2.5 kg/100 m^2
3	Regenerative perennial ryegrass (RPR)	Irrigated	3.0 kg/100 m^2
4	Regenerative perennial ryegrass (RPR)	Non-irrigated	3.0 kg/100 m^2
5	Home lawn mix1 (HLM)	Irrigated	2.0 kg/100 m^2
6	Home lawn mix (HLM)	Non-irrigated	2.0 kg/100 m^2

All plots were mowed on a weekly basis (beginning in May 2012) at a height of 5 cm and were fertilized May 25, August 10 and September 14, 2012 with a 25-5-10 fertilizer applied at a rate of 0.5 kg of N/100 m^2.

Irrigation

Irrigated plots were individually watered to supply 25 mm of water in a one week period during June, July and the first two weeks of August using a hose-end sprinkler. A flow meter was used to ensure that a precise volume of water was delivered to each plot (Fig. 1). If rainfall was equal to 25 mm of water, no irrigation was applied. If rainfall was between 0 and 25 mm of water, irrigation was applied to bring the total water applied up to 25 mm for that one week period. Non-irrigated plots received rainfall only.

Figures 2, 3 and 4 show the amount of rainfall and irrigation applied per week to the irrigated plots in June, July and the first half of August. The blue bars represent the amount of rainfall that the non-irrigated plots received per month. On July 18, 2012, all irrigated and non-irrigated plots received 25 mm of irrigation. This was done because there was a fear that all of the non-irrigated plots would die due to lack of water.

Establishment, species composition and weed invasion

Percent cover of each grass species [tall fescue (TF), perennial ryegrass (PR), Kentucky bluegrass (KB) and fine fescue (FF), broadleaf weeds (BLW) and bare areas (bare)] was recorded on five dates (June 8, August 4, August 23 and October 18, 2012). The broadleaf weeds

Figure 1. Application method for irrigating individual plots with a flow meter and hose end sprinkler.

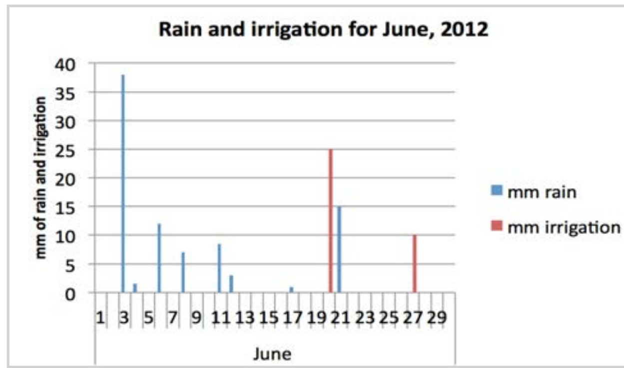

Figure 2. Millimeters of rain and irrigation for June, 2012.

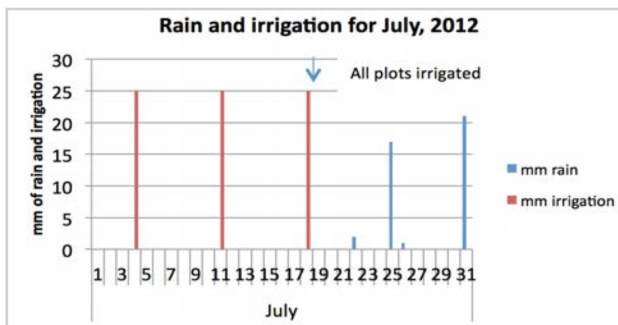

Figure 3. Millimeters of rain and irrigation for July, 2012.

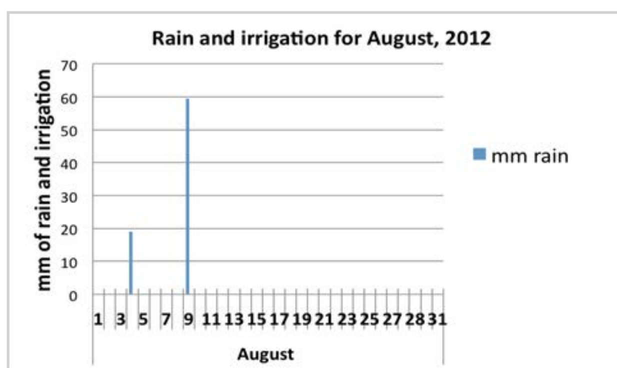

Figure 4. Millimeters of rain and irrigation for August, 2012.

found in these plots during the 2012 season were mainly annuals (i.e. black medick, whitlow grass, thyme-leaved sandwort, speedwell, purslane, chickweed, shepherd's purse, henbit, goldenrod and pineapple weed). Dandelions were also found in the plots but were one of the few perennial broadleaf weeds. Four randomized point quadrats measuring 60 cm x 60 cm with 25 points in each quadrat (points 10 cm apart) (Fig. 5) for a total of 100 points in each plot were used to determine percent species cover of each of the turfgrass species, broadleaf weeds and bare at each assessment date (Figures 6 and 9). A new category (dead/brown) was added on the August 4 and 23 assessment dates (Figures 7 and 8). All data were analysed using appropriate statistical methods.

Figure 5. Point quadrat used to estimate percent species cover in plots.

Figure 6 shows the species composition in the plots prior to the irrigation treatments and reflects how quickly each of the species established and how well they crowded out broadleaf weeds. Our main interest was the percent broadleaf weed cover and the percent bare. At this stage of the experiment, RPR and HLM provided good cover with very little bare area and were not significantly different from each other (11.75 and 13.625% bare respectively), while RTF had significantly more bare area (18.5%). Also, the three species treatments differed significantly from each other for broadleaf weed invasion with RTF having the most total BLW (47.75%), HLM having moderate weed invasion (31.25%) and the RPR having the least (23%).

Not surprising, these results show that RTF is slower to emerge and fill in than the RPR and HLM and that resulted in more BLW and more bare area with this slow to establish species. The RPR is very rapid to emerge and fill in and the perennial ryegrass in the HLM also provided quick establishment that helped to out-compete weeds and fill in the bare areas.

Figure 7 shows the status of the treatment plots after six weeks of irrigation or non-irrigation. The main differences were in the percent bare, dead/brown and total BLW. At this point in the season only the non-irrigated RTF had significantly more percent bare area than all of the other treatments (18.5%). The non-irrigated HLM and RPR had similar percentage of dead/brown (69.5 and 69% respectively) and they had more dead/brown percent area than the non-irrigated RTF (44%). Perhaps surprising was the percent BLW. The irrigated RTF had significantly more BLW (64.25%) than any of the other treatments. The irrigated HLM, irrigated RPR and the non-irrigated RTF did not differ significantly from each other for BLW (31.25, 31 and 30.25% respectively). The non-irrigated HLM and RPR had very few BLW.

At this date, when irrigation was added to plots that had lots of bare area, the result was an invasion of annual broadleaf weeds. On the non-irrigated plots, there were fewer weeds because there was not enough soil moisture for weed seed germination. In addition, the non-irrigated RTF had fewer dead/brown plants showing that it is superior at maintaining live non-dormant plants during prolonged periods without water.

The data represented in Figure 8 gives an indication of the ability of the non-irrigated turf species/mixture treatments to recover from drought and for the irrigated turf species/mixture treatment to recover from broadleaf weed invasion. The percent dead/brown decreased from August 4 – August 23, 2012 for all of the non-irrigated plots. The non-irrigated RPR had significantly more dead/brown plants (14.75%) than the irrigated RTF, non-irrigated RTF and the irrigated RPR (4.5, 4.25 and 2.75% respectively). Overall there was very good recovery of the dead/brown turf in most of the non-irrigated treatments, with the non-irrigated RPR lagging behind slightly.

Regarding the total BLW cover, the non-irrigated RTF and HLM had significantly more broadleaf weeds than any of the other treatments (74.25 and 69.5% respectively). The non-irrigated RPR and the irrigated RTF had the same amount of broadleaf weed cover (49.75 and 41% respectively) and the treatments with the

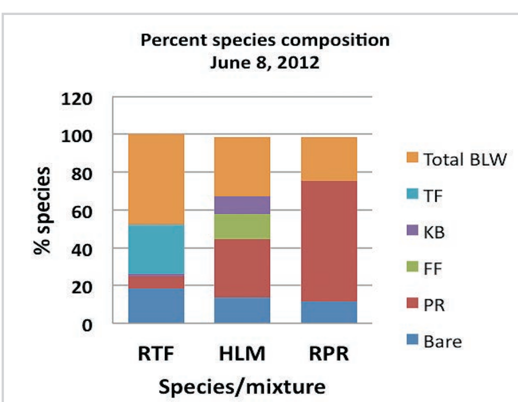

Figure 6. Percent species composition June 8, 2012.

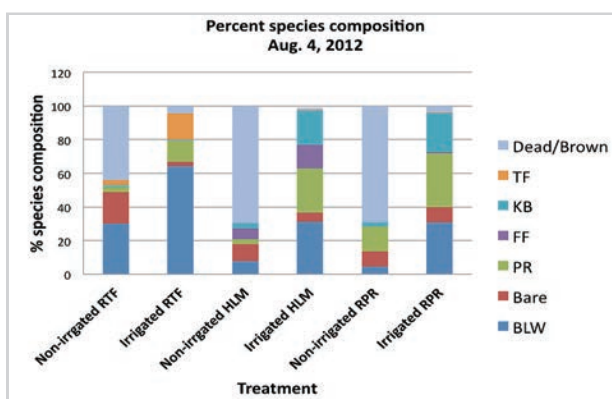

Figure 7. Percent species composition Aug. 4, 2012.

fewest broadleaf weeds were the irrigated HLM and RPR (26 and 24.25% respectively).

With the onset of timely rains during August, 2012 the bare areas in the non-irrigated plots were quickly populated by weeds as indicated by the total BLW cover in the non-irrigated RTR, HLM and RPR. Because the irrigated RTF also had a high percentage of bare areas, it also was invaded by broadleaf weeds when the late summer rains came.

The data in Figure 9 represents the percent species composition of the treated plots at the end of the first treatment year. Non-irrigated RTF had the most total BLW of all of the treatments (46.25%). The percent bare areas in the non-irrigated treatments increased from the August 23, 2012 to October 18, 2012 because many of the broadleaf weeds were annual weeds that died off after the first frost leaving bare areas. These bare areas could also be a result of some of the plants categorized as dead/brown actually being dead.

Another interesting observation at the end of the season was the species composition of the irrigated and non-irrigated HLM. The non-irrigated HLM had almost no Kentucky bluegrass plants in it (<1%) where the irrigated HLM had 11.5%, in spite of it comprising 50% of the seed mixture at seeding. There was significantly more FF in the irrigated HLM, which is not surprising because of FF's reputation for being drought tolerant.

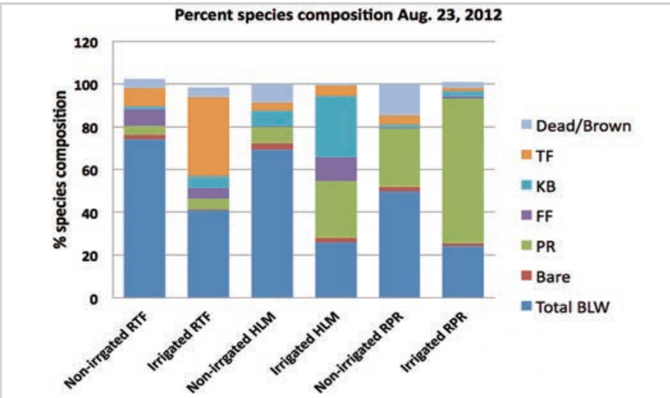

Figure 8. Percent species composition Aug. 23, 2012.

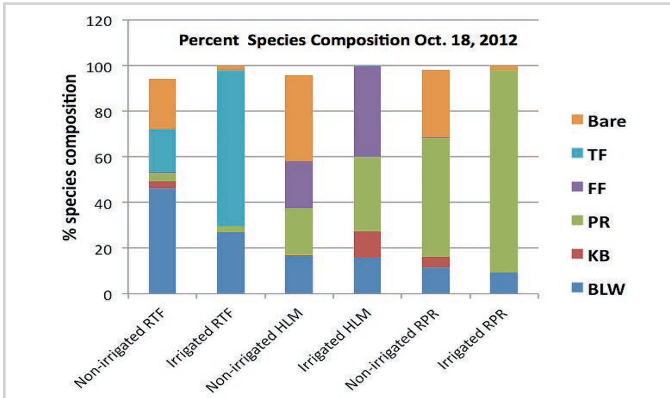

Figure 9. Percent species composition Oct. 18, 2012.

Serendipity

While walking past these plots in late October, a very interesting phenomenon was observed. One plot in each block of the experiment had been disturbed by an animal digging for grubs. When the plot map was consulted, it turned out that the plots that were dug up were all the irrigated HLM. There was clearly something different about these plots. The questions were:

1. Were there more grubs in the irrigated HLM than the other plots?
2. Was there the same number of grubs in all of the plots, but did the animal prefer digging in the irrigated HLM plots?

To answer this question, six cup changer plugs of turf per plot were examined for the presence of grubs in all plots.

The data presented in Figure 10 shows the irrigated HLM and RTF had the same number of grubs per 0.1 m^2, whereas the irrigated RPR plots contained approximately half the number of grubs per unit area. All of the non-irrigated plots regardless of the species/mixture had significantly fewer grubs per given area. What was interesting was the fact that even though the irrigated HLM and RTF had the same number of grubs, the animal digging for the grubs was only digging in the irrigated HLM. Figure 11 shows the irrigated HLM and non-irrigated HLM showing the animal digging in the irrigated HLM only. What we don't know is:

1. Did the grub eggs survive better in the irrigated HLM and RTF or did the female European chafer adults prefer laying their eggs in those plots?

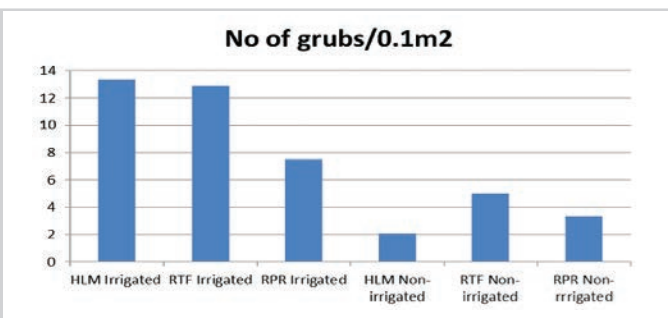

Figure 10. Number of grubs per 0.1/m^2

2. Why is the animal digging the irrigated HLM and not the RTF plots which both contain grubs?

With the help of Dr. Michael Brownbridge, VRIC, we hope that we can answer these questions next year.

Figure 11. Plot on the left shows the non-irrigated HLM and the plot on the right shows the irrigated HLM with animal digging.

Going forward

We now have RTF and RPR plots that have significant bare areas in which we can evaluate their ability to spread. In addition, we will also have data in the spring of 2013 to evaluate their ability to overwinter in Ontario (for one winter). We have established similar plots for 2013 with more cultivars of these spreading species to continue our evaluation of their performance in Ontario. Here is hoping for another extremely dry season so that we can evaluate another year of their performance in drought conditions, evaluate their ability to spread and resist insect and weed invasion. •

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