Weed Suppression in Turfgrass Using Different Species and Thicknesses of Leaf Mulch

Peter Purvis and Erica Gunn, *Guelph Turfgrass Institute, University of Guelph*
Pam Charbonneau, *Ontario Ministry of Agriculture Food. Ministry of Rural Affairs*

Autumn is a nice time of year. The beautifully cool, crisp weather, the spectacular colours and falling leaves...yes, the seemingly endless hours of raking fallen leaves. Many of us still physically remove leaves from our turf each fall, putting them in bags or moving them onto the street for pick up. However, some municipalities are tightening their rules on curb-side leaf collection.

Mulching tree leaves is an alternative to raking and has many positive benefits for the turfgrass ecosystem. Research at Purdue University found that adding mulched leaves to turf increased soil microbial activity and organic carbon content but did not increase thatch levels, did not promote turfgrass diseases and did not negatively affect visual turf quality or colour (1). Experiments at Michigan State found that the addition of mulched maple and oak leaves promoted early spring green-up and reduced populations of common dandelion in turf (2). The City of Guelph and other municipalities regularly mulch tree leaves in their parks and sport field complexes to manage their fallen leaves (Figure 1).

Turfgrass managers need effective, non-chemical methods for controlling weeds and promoting high quality soil and turf, particularly since the use of cosmetic pesticides is banned in many provinces and municipalities across Canada. This three year study examined the effectiveness of two thicknesses of mulched tree leaves and needles applied to control broadleaf weeds in established lawn-type turf. We also evaluated the overall turf and soil quality when mulched leaves were applied.

Materials and Methods

- In October 2010, eighty plots (20 treatments x 4 replications; each plot 2 m x 2 m in size) were established on weed infested lawn-type turf at the Guelph Turfgrass Institute, Guelph Ontario.

Figure 2: Research plots at the Guelph Turfgrass Institute with applied tree leaf and needle mulch.

Figure 3: A plot containing a 5 cm depth of mulched gingko leaves.

Table 1. Soil organic matter content (%), nutrient status (mg/L) and pH from samples collected in October 2012.

	OM	P	K	Mg	pH
Weedy control	4.2	7.8	73	318	7.7
Par 3 herbicide	3.6	4.2	53	310	7.8
Urea (0.25 kg N/100 m^2)	4.5	7.2	78	338	7.7
Urea (0.50 kg N/100 m^2)	3.3	4.1	58	313	7.8
All leaves and needles combined (2.5 cm)	3.9	8.1	77	325	7.8
All leaves and needles combined (5.0 cm)	4.2	10.8	82	335	7.7
White ash (2.5 cm)	3.3	4.4	51	293	7.8
White ash (5.0 cm)	4.2	4.8	57	305	7.7
Ginkgo (2.5 cm)	3.5	3.7	54	298	7.8
Ginkgo (5.0 cm)	3.7	6.1	57	318	7.8
Norway maple (2.5 cm)	3.7	5.5	62	325	7.7
Norway maple (5.0 cm)	3.8	3.6	61	305	7.8
Silver maple (2.5 cm)	3.8	4.2	63	313	7.8
Silver maple (5.0 cm)	4.0	5.8	66	323	7.8
Sugar maple (2.5 cm)	3.8	3.9	58	308	7.8
Sugar maple (5.0 cm)	3.8	4.5	59	325	7.7
Eastern white pine (2.5 cm)	3.8	4.9	57	310	7.7
Eastern white pine (5.0 cm)	3.6	5.1	59	325	7.7

- Leaves of Norway maple, silver maple, sugar maple, ginkgo and white ash, and needles of eastern white pine were collected from the Arboretum at the University of Guelph and separately mulched using a commercially available mulching lawn mower.
- The following treatments were applied in 2010, 2011 and 2012:

1. Mulched leaves or needles from each separate tree species applied to turf plots at two separate depths (2.5 cm or 5 cm thick; Figures 2 and 3).
2. A composite blend of all mulched leaves and needles applied at two separate depths (2.5 cm and 5 cm).
3. Fertilizer (Urea; 46-0-0) applied annually at two rates (0.25 and 0.50 kg N per 100 m^2) in May, September and October.
4. A broadleaf herbicide (Par 3 applied at 55 ml per 100 m^2) applied each September.
5. A weedy control plot with no treatment application.

- The plot area was maintained as lawn-type turf. The area was mowed at a height of 7 cm once per week. The plots were not irrigated.

Figure 1: A park in the City of Guelph before and after leaves were mulched.

- Throughout the experiment, turfgrass canopy reflectance readings (an indicator of turf quality and colour) were taken.
- Soil samples were collected each fall and sent to Laboratory Services at the University of Guelph for nutrient and organic matter analysis.

Result and Discussion

Soil Analysis

There were no significant (statistical) differences among treatments for soil organic matter content, nutrient content, or pH levels. These results were observed in all years but only the data for 2012 is shown (Table 1). It is interesting to note that plots receiving repeated applications of leaf mulch had similar physical and chemical properties as those receiving no mulch. It is likely that the duration of this trial was too short to detect any changes in soil properties. Soil physical and chemical changes would likely only appear after many years of leaf mulch application.

Weed Counts

The number of weeds per plot were counted each spring, summer and fall. The data shown is for October 2011 and 2012 (Table 2) but similar results were observed throughout the experiment. The predominant weed species (from most to least) were dandelion, white clover, black medic, birdsfoot trefoil, narrow-leaf plantain and chickweed. As expected, the least number of weeds were found in the plots sprayed with a broadleaf herbicide. In contrast, there were no statistical differences in the number of weeds per plot among the remaining treatments.

However, though not statistically different, a few interesting trends did emerge from the data. There tended to be fewer weeds in the plots where the maximum thickness of a composite blend of all leaves and needles was applied. There also tended to be fewer weeds in plots that received nitrogen fertilizer. For example in 2012, plots receiving a 5 cm depth of all leaves combined had 29% weed cover and plots receiving only nitrogen had up to 25% weed cover, whereas the corresponding weedy control plot had 44% weed cover (Table 2).

Turfgrass Quality

There were no differences among treatments in turf colour and quality throughout the experiment (data not shown). However, it is

Table 2. Total number of weeds per plot (%) in 2011 and 2012.

	Weeds per Plot (%)	
	October 2011	October 2012
Weedy control	37	44
Par 3 herbicide	13	1
Urea (0.25 kg N/100 m^2)	23	25
Urea (0.50 kg N/100 m^2)	26	24
All leaves and needles combined (2.5 cm)	29	38
All leaves and needles combined (5.0 cm)	21	29
White ash (2.5 cm)	30	36
White ash (5.0 cm)	39	44
Ginkgo (2.5 cm)	27	33
Ginkgo (5.0 cm)	39	40
Norway maple (2.5 cm)	35	31
Norway maple (5.0 cm)	25	32
Silver maple (2.5 cm)	32	35
Silver maple (5.0 cm)	38	44
Sugar maple (2.5 cm)	31	44
Sugar maple (5.0 cm)	17	32
Eastern white pine (2.5 cm)	32	41
Eastern white pine (5.0 cm)	31	34

significant to note that there were no detrimental effects on turfgrass colour and quality caused by any leaf mulch treatment, even at the maximum depth of application. Repeated addition of mulched leaves to turf did not cause any injury or harm to the grass.

Summary

This coming autumn, when leaves blanket your turf, why not mulch them instead of removing them? Even a thick layer of mulched leaves applied year-after-year will not harm your grass. In fact, it could possibly reduce the weed populations of your turf and improve your soil quality in the long term.

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Works Cited

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