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# Weed suppression in turfgrass using different species and thicknesses of leaf mulch

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## Executive Summary

The objective of this study was to determine the effectiveness of mulched leaves to control broadleaf weeds in lawn-type turf. The effectiveness of bark mulch, compost, fertility and herbicide were also examined. In the fall of 2010 and 2011, leaves of Norway maple, silver maple, sugar maple, eastern white pine, ginkgo and white ash were collected, separately mulched and applied to weed infested turf at the Guelph Turfgrass Institute. Commercially available bark mulch, compost, fertilizer and a broadleaf herbicide were also applied as separate treatments.

This report contains the second year data of a three year study. The predominant weed species in 2011 were dandelion, narrow-leaf plantain, birdsfoot trefoil, white clover, black medic and chickweed. There were few significant differences in numbers of weeds per plot, turfgrass quality and soil nutrient status and organic matter content among treatments. These results were expected since this is a long term study and it is likely that treatment effects will only be manifested after several treatment applications. It is significant to note that there were no detrimental effects on the turf caused by any leaf mulch treatment even at the maximum depth of leaf mulch application.

## Introduction

With the introduction of Ontario's Cosmetic Pesticide Ban it will be increasingly difficult to maintain high quality weed-free turf. Mulched leaves have been tested for weed control in turf but only using a few tree species and only on newly seeded dandelions. The effectiveness of numerous species of mulched tree leaves applied at two thicknesses to control many different species of broadleaf weeds in established lawn-type turf will be examined. The efficacy of bark mulch and compost, a fertility program and a broadleaf herbicide will also be studied.

## Objectives:

1. To determine the effectiveness of leaf mulch from six different tree species, and a combination of leaves from all species, to control broadleaf weeds in established turf.

2. To determine which depth of leaf mulch will provide the most effective weed control.

3. To determine the effectiveness of bark mulch and compost at two thicknesses as weed control measures.

4. To evaluate the overall turf and soil health under each treatment.

Methods

- Eighty-eight plots (22 treatments x 4 replications), each 2-m x 2-m, were created on established, weed infested lawn-type turf at the Guelph Turfgrass Institute in the fall of 2010.

- Leaves of Norway maple, silver maple, sugar maple, ginkgo, eastern white pine and white ash were collected from The Arboretum at the University of Guelph and separately mulched using a commercially available mulching lawn mower.

- Treatments included:

  - mulched leaves from each separate tree species applied at two depths (2.5-cm and 5-cm)
  - a composite blend of all mulched leaf species applied at two depths (2.5-cm and 5-cm)
  - commercially available bark mulch and compost each applied at two thicknesses (1.25-cm and 2.5-cm; purchased)

- fertilizer (urea; 46-0-0) applied at two rates (0.25 and 0.50 kg N per 100 $m^2$) in May, September and October for a seasonal total of 0.75 and 1.50 kg N per 100 $m^2$
- a broadleaf herbicide (Par 3 applied at 55 ml per 100 $m^2$)
- a weedy control plot with no treatment application.

- Treatments were initially applied in November 2010.

- In 2011, 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.

- In 2011, weed counts were taken in June, July and October; Turfgrass quality ratings were taken in May and July; and canopy reflectance readings (another indicator of turf quality and colour) were taken in June and July.

- Samples of mulched leaves, bark mulch, compost and soil samples were collected in November 2011 and send to Laboratory Services at the University of Guelph for nutrient analysis.

- In the November 2011, all treatments were re-applied as in 2010.

## Result and Discussion

*Nutrient Analysis*

The nutrient status of the mulched leaves (prior to treatment application) of gingko tended to be the highest while white pine tended to be the lowest (Table 1). The nutrient status of the other mulched leaf treatments tended to be similar to each other.

The applied treatments did not affect the soil nutrient and organic matter content, nor soil pH values. The soil nutrient content tended to be similar among all treatments (Table 3). It is interesting that the different nutrient status of the mulched leaves (Table 1) and the comparatively high nutrient status and organic matter content of the bark mulch and compost (Table 2) did not affect the soil nutrient status of their respective treatments (Table 3). It was expected that there would be no significant treatments effects at this stage of the experiment.

This is a long term study and it is likely that treatments effects will only be manifested after several treatment applications.

*Weed Counts*

The numbers of weeds per plot were counted in June, July and October in 2011 (Table 4). The predominant weed species were black medic, birdsfoot trefoil, chickweed, dandelion, narrow-leaf plantain and white clover. On all sampling dates, the least number of weeds tended to be found in the plots sprayed with a broadleaf herbicide. In June and July, there was no clear trend in weed numbers per plot among the other treatments. However in October, a 5-cm depth of ginkgo tended to have high numbers of weeds while the 5-cm depth of sugar maple tended to have fewer weeds. Again, it is likely that it will take a number of years before significant differences in weed numbers will be seen.

*Turfgrass Quality*

There tended to be no difference among treatments in turf colour and quality throughout the season (data not shown). It can be seen from the photographs (Figure 1) that the depth of mulch applied was substantial before the leaves were mulched and even after mulching. It is significant to note that there were no detrimental effects on turf quality caused by any leaf mulch treatment, even at the maximum depth of application.

**Table 1.** Nutrient content (%) of the mulched leaves prior to treatment application in November 2011.

| | N | P | K | Ca | Mg |
|---|---|---|---|---|---|
| All leaves combined | 1.1 | 0.29 | 0.68 | 2.62 | 0.40 |
| Ash | 0.99 | 0.16 | 0.54 | 2.35 | 0.25 |
| Ginkgo | 1.27 | 0.58 | 1.32 | 3.37 | 0.68 |
| Norway maple | 1.43 | 0.13 | 0.30 | 2.53 | 0.26 |
| Silver maple | 0.97 | 0.16 | 0.36 | 2.52 | 0.33 |
| Sugar maple | 0.96 | 0.10 | 0.16 | 2.35 | 0.21 |
| White pine | 0.64 | 0.03 | 0.06 | 0.77 | 0.17 |

**Table 2.** Nutrient status (mg/L), organic matter content (%) and pH of the actual bark mulch and compost prior to treatment application in November 2011.

| | OM | P | K | Mg | pH |
|---|---|---|---|---|---|
| Bark mulch | 49 | 6.2 | 200 | 208 | 6.2 |
| Compost | 25 | 92 | 3850 | 980 | 7.4 |

**Table 3.** Soil nutrient status (mg/L), organic matter content (%) and pH from samples collected in November 2011, just prior to the second round of treatment applications.

| | OM | P | K | Mg | pH |
|---|---|---|---|---|---|
| Weedy control | 3.4 | 7.0 | 64 | 325 | 7.8 |
| Par 3 herbicide | 3.6 | 4.1 | 78 | 378 | 7.8 |
| Urea (0.25 kg N/100 $m^2$) | 3.0 | 3.0 | 64 | 348 | 7.8 |
| Urea (0.50 kg N/100 $m^2$) | 3.3 | 3.4 | 60 | 345 | 7.8 |
| Bark mulch (1.25-cm) | 3.4 | 3.8 | 65 | 305 | 7.8 |
| Bark mulch (2.5-cm) | 2.9 | 3.1 | 65 | 303 | 7.9 |
| Compost (1.25-cm) | 3.1 | 3.4 | 62 | 310 | 7.8 |
| Compost (2.5-cm) | 3.3 | 6.2 | 69 | 308 | 7.8 |
| All leaves combined (2.5-cm) | 3.5 | 6.4 | 80 | 323 | 7.7 |
| All leaves combined (5.0-cm) | 3.1 | 3.6 | 58 | 308 | 7.8 |
| Ash (2.5-cm) | 3.2 | 4.0 | 69 | 325 | 7.8 |
| Ash (5.0-cm) | 3.2 | 4.3 | 63 | 303 | 7.9 |
| Ginkgo (2.5-cm) | 3.5 | 5.6 | 77 | 343 | 7.7 |
| Ginkgo (5.0-cm) | 3.1 | 4.0 | 51 | 303 | 7.8 |
| Norway maple (2.5-cm) | 3.1 | 4.3 | 56 | 310 | 7.9 |
| Norway maple (5.0-cm) | 3.4 | 3.5 | 66 | 303 | 7.8 |
| Silver maple (2.5-cm) | 3.3 | 3.7 | 66 | 343 | 7.8 |
| Silver maple (5.0-cm) | 3.3 | 4.7 | 67 | 313 | 7.8 |
| Sugar maple (2.5-cm) | 3.2 | 5.5 | 75 | 343 | 7.8 |
| Sugar maple (5.0-cm) | 3.2 | 5.1 | 58 | 295 | 7.8 |
| White pine (2.5-cm) | 3.3 | 3.8 | 67 | 330 | 7.7 |
| White pine (5.0-cm) | 3.5 | 5.6 | 77 | 313 | 7.8 |

**Table 4.** Number of weeds per plot (%) on three dates in 2011.

| | June 03 | July 18 | October 17 |
|---|---|---|---|
| Weedy control | 17 | 37 | 37 |
| Par 3 herbicide | 5 | 10 | 13 |
| Urea (0.25 kg N/100 $m^2$) | 10 | 28 | 23 |
| Urea (0.50 kg N/100 $m^2$) | 14 | 23 | 26 |
| Bark mulch (1.25-cm) | 15 | 15 | 34 |
| Bark mulch (2.5-cm) | 15 | 19 | 30 |
| Compost (1.25-cm) | 20 | 41 | 38 |
| Compost (2.5-cm) | 15 | 32 | 31 |
| All leaves combined (2.5-cm) | 17 | 31 | 29 |
| All leaves combined (5.0-cm) | 12 | 20 | 21 |
| Ash (2.5-cm) | 20 | 33 | 30 |
| Ash (5.0-cm) | 20 | 38 | 39 |
| Ginkgo (2.5-cm) | 13 | 24 | 27 |
| Ginkgo (5.0-cm) | 25 | 43 | 39 |
| Norway maple (2.5-cm) | 25 | 37 | 35 |
| Norway maple (5.0-cm) | 15 | 23 | 25 |
| Silver maple (2.5-cm) | 15 | 33 | 32 |
| Silver maple (5.0-cm) | 25 | 43 | 38 |
| Sugar maple (2.5-cm) | 15 | 31 | 31 |
| Sugar maple (5.0-cm) | 15 | 27 | 17 |
| White pine (2.5-cm) | 25 | 32 | 32 |
| White pine (5.0-cm) | 20 | 36 | 31 |

**Figure 1.** Photographs of white pine needles and Norway maple leaves before and after mulching.

Needles of white pine prior to mulching

Needles of white pine after mulching

Leaves of Norway maple prior to mulching

Leaves of Norway maple after mulching