MULCHING TREE LEAVES INTO KENTUCKY BLUEGRASS TURF - AN UPDATE

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INTRODUCTION

The objectives of two ongoing studies at the Hancock Turfgrass Research Center are to examine the effects of mulching tree leaves on the soil properties and visual quality of Kentucky bluegrass turf.

The importance of these studies can best be perceived when examining the alternatives for yard wastes like the tree leaves. Among the alternatives are the following. (1) Leave the leaves. This not only thins out the turf but also creates a mess for the homeowner. (2) Rake and burn. This is no longer a realistic option. Effective on March 27, 1995 the Solid Waste Management Act prohibits the open burning of leaves in municipalities having a population of 7,500 or more. Many municipalities with populations under 7,500 also have local ordinances that prohibit open burning. (3) Bag for landfill. Most municipalities understand landfill space has become too costly to be used in this manner. In a **1984** survey of Michigan municipalities that composted their leaves, the city of Alma claimed a savings of $17,681 by composting instead of placing the leaves in the landfill. (4) Municipal Composting. This practice provides natural organic product for reuse. It does incur a cost and requires space. From the above mentioned survey of 34 municipalities **average** costs for leaf handling were:

leaf collection program cost per 1000 population, $2353.41;
leaf collection labor cost per curb-mile collected, $ 135.59; and
leaf collection equipment cost per curb-mile collected, $ 223.25.

In 1984 the city of Alma had a population of 9,652 with 85 miles of curb-mile collection area. Assuming the above figures their cost for leaf collection would have been $53,216.51. Some municipalities pay to have their leaves hauled away for compost. The current rate charged is approximately $2.00-2.50 per cubic yard of leaves. (5) Personal Compost. A good solution if you do not have many leaves, but with limited yard space this is not a viable solution. Further, personal compost piles are illegal in some areas. (6) Mulch leaves into the existing lawn. If there are no negative effects on the lawn this could help alleviate a number of problems.

METHODS

The first study was initiated in October, 1990. Three leaf rates (none, low, and high) were applied on 4 X 8 foot plots. The low rate was approximately 50 lbs. of dry leaves per 1000 sq. ft. and the high rate was roughly 100 lbs. of dry leaves per 1000 sq. ft. The leaves were predominantly maple with leaves from a few other species present. The leaves were mowed with enough passes to adequately mulch the leaves. Two nitrogen fertilization schedules were followed: a spring emphasis with applications in April, June, July, and September, and a fall emphasis with applications in June, July, September, and November. The nitrogen was applied as urea with a drop spreader. Each treatment was replicated three times and results represent an average of the three treatments.

The second study was initiated in October, 1991. Two leaf types (oak or maple) were mulched into a Kentucky bluegrass turf. The rate, approximately 100 lbs. of dry leaves per 1000 sq. ft., was roughly

four inches deep when evenly distributed over the plots. Nitrogen was applied at 4 lbs. N per 1000 sq. ft. annually with either a spring or late fall emphasis. Spring emphasis applications were applied in April, May, July, and August while the fall dates were applied in June, July, September, and October. A treatment with no nitrogen was also included and there were three replications of each treatment.

RESULTS

Quality ratings are observations made on turf color and density. The number nine is assigned to excellent turf, one represents yellow or brown turf, and every number greater than 5.5 represents acceptable quality. The quality ratings for studies one and two are shown in Tables 1 and 2, respectively. Since nitrogen has a positive effect on color it is important to compare leaf rates or types with corresponding nitrogen variables. Overall, few differences appear in the quality ratings for either study. On May 13th for study 1 (Table 1) there is a slight trend for better turf quality on the non-mulched plots. In Table 2 other quality rating differences are small.

Soil samples were obtained in October, 1993. Tables 3 and 4 give the soil test results from studies 1 and 2, respectively. In regards to leaf-mulch there are no meaningful differences in soil tests for either study. The soil phosphorous levels in study 1 are all very high, but are medium in study 2 and soil potassium levels are medium low in both studies. These effects are primarily a result of management practices on the sites prior to the leaf-mulch studies. However, difference do occur because of nitrogen rate and trends appear to indicate that leaf-mulch may provide some phosphorous and potassium.

There were no meaningful differences in percentage of organic matter in the thatch layer or in the thatch thickness for study 1 (Table 5). No differences occurred in percent of dandelions per plot nor percent of plot infected with necrotic ring spot. In Table 6 (study 2) there was a trend for maple leaves to have a higher percent organic matter than the check, but this was statistically significant only for the fall nitrogen treatments. However, no differences occurred in thatch thickness. The number of dandelions per plot tends to be greater on the no nitrogen plots and there was more necrotic ring spot than on the plots that received nitrogen.

Table 1. Leaf Mulch-Nitrogen Study, Initiated 1990
Quality Ratings, 1993

1=poor 9=excellent

Leaf Rate	Nitrogen Per Year	Timing	4-20	5-13	6-2	7-1	7-14	8-13	9-2	10-14
High	2 lbs.N/M	Spring	6.0 ab	7.7 abcd	7.8 abcd	8.0 a	8.0 ab	8.0 a	8.2 ab	8.3 a
High	2 lbs.N/M	Fall	5.3 b	6.5 e	7.0 d	8.0 a	8.0 ab	8.0 a	7.8 ab	8.7 a
High	4 lbs.N/M	Spring	6.0 ab	8.2 abc	8.0 abc	8.0 a	7.7 b	8.0 a	7.8 ab	8.7 a
High	4 lbs.N/M	Fall	6.5 a	7.0 de	7.3 cd	8.0 a	8.3 a	8.0 a	7.5 b	7.7 a
Low	2 lbs.N/M	Spring	5.8 ab	7.5 bcd	7.8 abcd	8.0 a	8.0 ab	8.0 a	8.0 ab	8.2 a
Low	2 lbs.N/M	Fall	5.8 ab	6.8 de	7.0 d	8.0 a	8.0 ab	8.0 a	8.2 ab	8.3 a
Low	4 lbs.N/M	Spring	6.2 ab	8.3 ab	8.5 a	8.0 a	8.0 ab	8.0 a	8.2 ab	8.7 a
Low	4 lbs.N/M	Fall	6.5 a	7.3 cde	7.8 abcd	8.0 a	8.0 ab	8.0 a	8.0 ab	8.3 a
None	2 lbs.N/M	Spring	5.3 b	8.3 ab	7.7 abcd	8.0 a	8.0 ab	8.0 a	8.5 a	8.5 a
None	2 lbs.N/M	Fall	6.2 ab	7.5 bcd	7.5 bcd	8.0 a	8.0 ab	8.0 a	8.0 ab	8.0 a
None	4 lbs.N/M	Spring	6.5 a	8.5 a	8.3 ab	8.0 a	8.0 ab	8.0 a	8.0 ab	8.5 a
None	4 lbs.N/M	Fall	6.7 a	7.5 bcd	7.7 abcd	8.0 a	8.0 ab	8.0 a	8.2 ab	8.7 a

Means in columns followed by the same letter are not significantly different at the 5% level using the LSD mean separation test.

Leaf Rate: High = 96 lbs. / 1000 sq. ft.
Low = 48 lbs. / 1000 sq. ft.

Table 2. Oak & Maple Leaf Mulch Study, Initiated 1991
Quality Ratings, 1993

1 = poor, 9 = excellent

Leaves 96#/M	Nitrogen Per Year	Timing	4-20	5-13	6-2	7-1	7-14	8-13	9-5	10-14
None	None	n/a	6.0 d	7.7 bc	6.3 c	5.0 b	6.7 c	6.0 c	6.8 bcd	7.2 c
Oak	None	n/a	5.5 e	7.0 c	6.8 c	5.8 b	7.3 b	6.0 c	6.7 d	7.3 bc
Maple	None	n/a	6.0 d	7.0 c	6.3 c	5.0 b	6.0 d	6.3 b	7.5 bcd	8.0 abc
None	4lb.N/M	Spring	6.3 cd	8.5 a	9.0 a	7.8 a	8.0 a	8.0 a	7.8 abc	8.3 ab
Oak	4lb.N/M	Spring	6.0 d	8.5 a	8.8 a	8.0 a	8.0 a	8.0 a	8.8 a	8.5 a
Maple	4lb.N/M	Spring	6.0 d	8.3 ab	8.7 a	7.8 a	8.0 a	8.0 a	8.0 ab	8.5 a
None	4lb.N/M	Fall	7.0 a	8.5 a	8.0 b	8.0 a	8.0 a	8.0 a	8.5 ab	8.5 a
Oak	4lb.N/M	Fall	6.5 bc	8.2 ab	8.0 b	8.2 a	8.0 a	8.0 a	8.2 ab	8.8 a
Maples	4lb.N/M	Fall	6.9 ab	8.2 ab	7.5 b	7.7 a	8.0 a	8.0 a	8.3 ab	8.7 a

Means in columns followed by the same letter are not significantly different at the 5% level using the LSD mean separation test.

Table 3. Leaf Mulch Nitrogen Study, Initiated 1990
Soil Test Results, October, 1993

Leaf Rate	Nitrogen Per Year	Timing	pH	lbs. P per Acre	lbs. K per Acre	lbs. Ca per Acre	lbs. Mg per Acre
High	2 lbs.N/M	Spring	7.4 ab	116 ab	92 ab	2159 a	357 a
High	2 lbs.N/M	Fall	7.4 ab	115 ab	86 ab	2184 a	381 a
High	4 lbs.N/M	Spring	7.5 ab	166 a	74 bc	2159 a	365 a
High	4 lbs.N/M	Fall	7.5 ab	90 b	77 abc	2260 a	349 a
Low	2 lbs. N/M	Spring	7.4 ab	93 b	74 bc	2032 a	360 a
Low	2 lbs. N/M	Fall	7.5 ab	102 b	83 ab	2006 a	363 a
Low	4 lbs. N/M	Spring	7.4 ab	133 ab	74 bc	2057 a	352 a
Low	4 lbs.N/M	Fall	7.37 b	137 ab	77 abc	2260 a	355 a
None	2 lbs.N/M	Spring	7.5 ab	103 b	74 bc	2108 a	381 a
None	2 lbs.N/M	Fall	7.5 a	133 ab	98 a	2184 a	352 a
None	4 lbs.N/M	Spring	7.5 a	140 ab	56 c	2108 a	355 a
None	4 lbs.N/M	Fall	7.4 ab	111 b	56 c	2057 a	360 a

Means in columns followed by the same letter are not significantly different at the 5% level using the LSD mean separation test.

Leaf Rates: High = 96 lbs. / 1000 sq. ft.
Low = 48 lbs. / 1000 sq. ft.

Table 4. Oak and Maple Leaf Mulch Study Initiated 1991
Soil Test Results 1993

Leaf Rate 96 lbs./M	Nitrogen Per Year	Timing	pH	lbs. P per Acre	lbs. K per Acre	lbs. Ca per Acre	lbs. Mg per Acre
None	None	n/a	7.6 ab	30.7 bc	89.0 ab	1993 a	338.7 a
Oak	None	n/a	7.4 ab	32.3 ab	106.7 a	1824 a	354.7 a
Maple	None	n/a	7.5 ab	35.3 a	115.7 a	2021 a	322.7 a
None	4lb.N/M	Spring	7.3 b	28.0 cd	50.3 c	1768 a	328.0 a
Oak	4lb.N/M	Spring	7.4 ab	29.7 bc	47.3 c	1743 a	322.7 a
Maple	4lb.N/M	Spring	7.6 a	27.7 cd	65.0 bc	2077 a	330.7 a
None	4lb.N/M	Fall	7.4 ab	28.0 cd	50.0 c	1740 a	341.3 a
Oak	4lb.N/M	Fall	7.5 ab	25.7 d	53.0 c	2077 a	328.0 a
Maple	4lb.N/M	Fall	7.5 ab	26.3 d	53.3 c	1909 a	333.3 a

Means in columns followed by the same letter are not significantly different at the 5% level using the LSD mean separation test.

Table 5. Leaf Mulch Nitrogen Study, Initiated 1990
Data from 1993

Leaf Rate	Nitrogen Per Year	Timing	Organic Matter, %	Thatch Thickness, mm	Dandelions, %	Necrotic Ring Spot, %
High	2 lbs.N/M	Spring	19.3 a	28.1 ab	0.0 a	1.3 a
High	2 lbs.N/M	Fall	19.3 a	28.3 ab	0.3 a	2.3 a
High	4 lbs.N/M	Spring	16.3 a	25.8 ab	0.0 a	0.3 a
High	4lbs.N/M	Fall	19.0 a	28.5 ab	0.0 a	1.7 a
Low	2 lbs.N/M	Spring	18.3 a	26.8 ab	0.0 a	1.0 a
Low	2 lbs.N/M	Fall	20.0 a	28.8 a	0.0 a	0.0 a
Low	4 lbs.N/M	Spring	17.0 a	25.0 b	0.0 a	0.3 a
Low	4 lbs.N/M	Fall	16.7 a	26.8 ab	0.3 a	0.0 a
None	2 lbs.N/M	Spring	16.3 a	25.5 ab	0.7 a	0.3 a
None	2 lbs.N/M	Fall	18.3 a	26.0 ab	1.3 a	1.0 a
None	4 lbs.N/M	Spring	17.7 a	25.9 ab	0.3 a	0.0 a
None	4 lbs.N/M	Fall	19.0 a	25.7 ab	0.3 a	0.0 a

Means in columns followed by the same letter are not significantly different at the 5% level using the LSD mean separation test.

Leaf Rate: High = 96 lbs. / 1000 sq. ft.
Low = 48 lbs. / 1000 sq. ft.

Table 6. Oak & Maple Leaf Mulch Study Initiated 1991 Data from 1993

Leaf Rate 96 lbs./M	Nitrogen Per Year	Timing	% Organic Matter	Thatch Thickness mm	% Dandelions	% Necrotic Ring Spot
None	None	n/a	12.0 bc	29.7 a	3.0 b	10.7 a
Oak	None	n/a	10.0 bc	29.7 a	6.3 a	7.7 a
Maple	None	n/a	16.0 ab	25.6 a	1.7 bc	9.3 a
None	4lb.N/M	Spring	10.0 bc	27.9 a	0.0 c	0.0 b
Oak	4lb.N/M	Spring	15.0 abc	27.6 a	0.0 c	0.0 b
Maple	4lb.N/M	Spring	13.3 abc	29.2 a	0.7 bc	O.3 b
None	4lb.N/M	Fall	9.0 c	29.2 a	0.0 c	0.0 b
Oak	4lb.N/M	Fall	14.7 abc	29.0 a	0.7 bc	0.0 b
Maple	4lb.N/M	Fall	18.7 a	28.8 a	0.3 c	0.0 b

Means in columns followed by the same letter are not significantly different at the 5% level using the LSD mean separation test.

CONCLUSIONS

Observations on quality ratings for both studies indicated differences between mulched and non-mulched turfgrass plots were negligible. This is also true for thatch, presence of weeds and disease, and soil tests.

At this time there is no conclusive proof that mulching leaves has a significant positive or negative effect on Kentucky bluegrass turf. From this we can recommend mulching leaves into turf as an alternative to removal. For turfs which are mowed closer, lower rates of leaves may be necessary to be sure the leaf mulch does not shade the grass, causing a loss of turf density. Effective reduction of size of mulched leaves will be much more effective if the leaves are dry when mulched. These studies will continue to address long term effects of mulching tree leaves.