TURFGRASS CULTURAL PRACTICES REPORT

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Leaf Mulch Studies

Since 1990 three studies have been conducted at the Hancock Turfgrass Research Center (HTRC) that examine the feasibility of mulching leaf litter into existing turfgrass canopies. The first study examined different leaf rates (50 and 100 lbs. dry leaves / 1000 sq. ft.) and the timing of nitrogen fertility. The objectives were to determine if there were any negative effects of mulching tree leaves into the existing turfgrass canopy with a lawn mower and if the nitrogen fertility would enhance leaf litter decomposition. The study ended in 1996 concluding that there were no negative effects of mulching the leaves into the turf at the rates applied and that the nitrogen treatments did not aid in the degradation of the leaf litter. The second study was initiated in October, 1991 to examine the effects of mulching different leaf types (oak and maple) at a rate of 100 lbs. dry leaves per 1000 sq. ft. into a Midnight Kentucky bluegrass turf using a rotary push-mower. This study was concluded in the fall of 1998. Objectives included were to determine if the different leaf types would have an effect on soil pH and or turfgrass quality. Turfgrass quality increased on plots that had maple leaf treatments due to the fact that fewer broadleaf weed growth was observed in these plots. No differences were observed regarding soil pH for the duration of the field experiment. Soil cores taken in the fall of 1998 concluded that there was an increase in the amount of organic matter in plots that had oak and maple leaves mulched into them compared to the check plot (Table 1). Tissue analysis of clippings collected in October of 1998 also found that the grass plants that came from plots having leaves mulched into them also had a greater percentage of carbon and nitrogen. However, the carbon nitrogen ratio was not affected.

Table 1. % of Organic Matter in the Thatch Layer and the % of Carbon and Nitrogen in the Turfgrass Clippings of Poa pratensis cv. Midnight from October of 1998

	% Organic Matter	% C in turf tissue	% N in turf tissue	C/N Ratio
Control	7.5 b	1.7 b	0.13 b	13
Oak leaves	8.9 a	2.1 b	0.16 a	13
Maple Leaves	8.4 a	2.1 b	0.16 a	13
LSD at (0.05)	0.7 *	0.1 *	0.01 *	N.S.

* Significant at 0.01 probability level.
Means in columns followed by the same letter are not statistically different at the 5% level using the LSD mean separation test.

The previous studies led us to conclude that there were more benefits than negatives for turf managers and homeowners that mulch tree leaves into their existing sites. The question became "Could there be an expanded roll for turfgrass in the leaf litter collection process"? With decreasing landfill space many states have looked to farm fields as a means of alleviating their leaf litter disposal. Truckloads of leaves were taken to farms and the leaves were tilled into the soil. However, it was found that this activity had the potential to increase the C/N ratio to 50 to 1. When the C/N ration goes above 30 to 1 nitrogen inputs are required to put the system in balance to make nitrogen available to the plant for uptake. It was also determined that some loading of heavy metals was taking place due to the collection process of the leaf litter and automobile parts were being reported by farmers who partook in the exercise. With that in mind our third leaf mulching study was initiated in October of 1995. The objective was to determine if low maintenance turfgrass sites could take heavy loads of deciduous leaves and maintain their usefulness. The study consisted of mulching a mix of deciduous leafs into an existing sunny seed mix turf (Kentucky bluegrass, perennial rye, and fine fescue). Excessive dry leaf rates of 150, 300 and 450 lbs. per 1000 sq. ft. were mulched in with the aid of a mulching mower. Two mower deck heights (1.5 and 3 inches) were included in the study to determine if deck height had a significant impact on the degradation of the leaf

litter. The area was mowed at 2.5 inches for the remainder of the year. Furthermore, since the plots represented low input turfgrass areas they never received fertilization for the three years in which the experiment ran. Check plots were included in the study and there were three replications of each treatment.

When mulching in leaves at such excessive rates visible leaf litter was observed in the early spring. In Table 2 the percentage of each plot displaying visible leaf litter in the early spring is reported. As expected, as the rate of leaves mulched into the plots increased, the percentage of visible leaf litter increased. However, at the higher deck leaf-mulching height of 3" there was reduced visibility of leaf litter the following spring. This is most apparent at the dry leaf rate of 300 lbs. / 1000 sq. ft. It is noteworthy that all visible leaf litter soon dissipated as the grass growth increased in the spring.

Table 2. Percentage of Visible Leaf Litter March 31, 1998

Leaf Mulching Rate	**1.5" Mower Deck Mulching Height**	**3" Mower Deck Mulching Height**
Control	0.0 d	0.0 d
150 lbs. / 1000 sq. ft.	5.0 cd	3.0 cd
300 lbs. / 1000 sq. ft	21.0 b	6.0 c
450 lbs. / 1000 sq. ft.	51.0 a	47.7 a
LSD at (0.05)		4.0 *

* Significant at 0.01 probability level.
Means followed by the same letter are not statistically different at the 5% level using the LSD mean separation test.

Since the plots represent turfgrass areas of low input it follows that areas receiving leaf litter for mulching would be municipal parks and low-maintenance ball fields. This means that the areas would be utilized for numerous outdoor activities that would result in persons coming into contact with the turf. With that in mind the surface hardness of the plots were taken twice in 1999 with the aid of the Clegg Impact Hammer. Data is reported in Table 3. The greater the number, the harder the surface. On July 29 all numbers are greater than on June 11. This suggests that the plots were drier due to less rainfall and increased temperatures in the summer. On July 29 the control plot was harder than plots receiving leaf mulch treatments. This indicates that leaf mulching provides a cushion that would be more forgiving to come in contact with for persons engaging in physical activity in the area.

Table 3. Surface Hardness Measured with the Clegg Impact Hammer (G)

Leaf Mulching Rate	**June 11, 1999**	**July 29, 1999**
Control	49 a	61 a
150 lbs. / 1000 sq. ft.	46 a	51 b
300 lbs. / 1000 sq. ft	40 b	47 bc
450 lbs. / 1000 sq. ft.	41 b	44 c
LSD at (0.05)	3.2 *	6.8 *

* Significant at 0.01 probability level.
Means in columns followed by the same letter are not statistically different at the 5% level using the LSD mean separation test.

As previously mentioned the C/N ratio was a potential problem when applying leaf litter to agricultural fields. For that reason samples were obtained to analyze the C/N ration of the soil on the turfgrass plots in September of 1999. No differences were anticipated regarding the C/N ration because no apparent color differences were recorded on the plots that would indicate that the plots required nitrogen fertilization in comparison with the check plots. Samples were obtained to analyze the C/N ratio in the thatch, the soil below the first three inches under the thatch, and thatch and soil layer measuring a total of

three inches. In Table 4 the latter of these three samples is reported. The other two are currently being analyzed in the laboratory. As the amount of leaf litter applied increased, the percentage of carbon and nitrogen increased in the soil thatch layer. However, the increases were such that the C/N ratio did not significantly increase and was maintained well below the 30/1 ratio.

Table 4. Carbon/Nitrogen Ration in Thatch Soil Layer Measuring 3" Below Verdure. September 1999

Leaf Mulching Rate	% C	% N	C/N ratio
Control	1.6 c	0.13 c	12.7
150 lbs. / 1000 sq. ft.	2.0 bc	0.14 bc	14.8
300 lbs. / 1000 sq. ft	2.5 ab	0.18 ab	14.2
450 lbs. / 1000 sq. ft.	2.8 a	0.19 a	14.5
LSD at (0.05)	0.5 *	0.04 *	N.S.

* Significant at 0.01 probability level.
Means in columns followed by the same letter are not statistically different at the 5% level using the LSD mean separation test.

Soil samples collected in September of 1999 are reported in Table 5. Samples were obtained from the standard 0-3" depth. No significant differences were observed regarding the soil pH or the amounts of phosphorous, potassium, or calcium regarding leaf loading.

Table 5. Soil Test Results 0-3" Depth September 1999

Leaf Mulching Rate	PH	Lbs. P/A	Lbs. K/A	Lbs. Ca/A
Control	6.5			
150 lbs. / 1000 sq. ft.	6.5			
300 lbs. / 1000 sq. ft	6.7			
450 lbs. / 1000 sq. ft.	6.4			
LSD at (0.05)	N.S.	N.S.	N.S.	N.S.

* Significant at 0.01 probability level.
Means in columns followed by the same letter are not statistically different at the 5% level using the LSD mean separation test.

Putting Green Rootzone Study

This is a cooperative putting green study with J.N. Rogers III and J.M. Vargas Jr. The research was conducted at the Hancock Turfgrass Research Center on the campus of Michigan State University, East Lansing, Michigan on a 14,400 ft^2 (120 x 120 ft) experimental putting green constructed in summer 1992 and seeded in spring 1993 with Penncross creeping bentgrass. The three rootzone mixes were; an 80:20 (sand: peat) mixture built to USGA recommendations; an 80:10:10 (sand:soil:peat) mixture built with subsurface drainage; and an unamended sandy clay loam textured (58% sand, 20.5% silt, and 21.5% clay) "push-up" style green. The putting greens are 1600 ft^2 (40 x 40 ft), replicated three times, and have individual irrigation control. Each green was split for lightweight green rolling in 1995 producing greens that measured 17 x 35 ft. A collar separates these greens. In 1996 a nitrogen-potassium interaction study was initiated. On each green there are two nitrogen treatments and 3 potassium treatments. This area is funded in part by the United States Golf Association (USGA).

The greens were mowed six times per week at a cutting height of .157 inch and the collars were mowed three times per week at the cutting height of .375 inches. Lightweight green rolling was performed with an Olathe roller three times per week after mowing. The Olathe roller is commonly referred to as a "sidewinder" because the transport tires raise and the practice of rolling takes place perpendicular to the position of the operator. The Olathe has three smooth cylindrical rollers situated under the driver. Sand topdressing has been applied to the greens every two to three weeks throughout the growing season. The sand topdressing has exceeded 1.75 inches.

Beginning in June of 1996 differences in dollar spot activity have been recorded due to construction method and lightweight green rolling. Since that time two observations have persisted 1) the greater the fines in the original construction mix the lesser the degree of dollar spot infection and 2) plots receiving lightweight green rolling three times per week have produced less dollar spot activity than non-rolled plots.