

Phosphorus Fertilizer Re-Training Program

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It's hard to believe that it is now time to renew your Phosphorus Fertilizer Training certificate. For some of you, on January 1, 2006, the two year period that your initial training was good for will have expired. In order to accommodate over 400 people in Minnesota that have taken the 4-hour training session, re-training will occur via correspondence. Remember, this training is required by the state of Minnesota if you are a golf course employee and you want to be exempt from the legislation restricting the use of P fertilizers.

Here is how this will work. You read this article and research update on Phosphorus fertilizer fate. At the conclusion of the article, YOU are responsible for filling out and signing the tear-off then sending it to MGCSA office at the address provided. Signed tear-offs will be accepted until December 31, 2005.

If you have not completed the 4-hour training course, this does not apply to you. You need to complete the 4-hour training course first which is good for 2 years following completion. The next 4-hour training will be offered at the Green Expo on January 3, 2006.

If you have any questions, feel free to contact me at bphorgan@umn.edu.

RESEARCH UPDATE

Statewide regulations restricting phosphorus fertilizer application to turfgrass went into effect on January 1, 2005. This legislation prohibits the use of phosphorus containing fertilizers on established turf unless a soil or tissue test indicates a need. Golf course personnel are exempt if they have completed a certified phosphorus

fertilizer training course offered by the University of Minnesota. One of the provisions of the initial law was that effectiveness of the bill was to be evaluated through research and reported back to the legislature: "...the Commissioner must evaluate the effectiveness of the restrictions on phosphorous fertilizers under this section and report to the legislature by January 15, 2007".

In order to determine the environmental impacts of restricting phosphorus in lawn fertilizer, a dedicated research facility was established at the Turfgrass Research, Outreach, and Education (TROE) Center on the St. Paul Campus at the University of Minnesota during the 2004 growing season. The overall objective of this ongoing study is to determine the effects of phosphorus and clipping management on phosphorus runoff and turf health.

Methods: A sloped plot of land at the TROE Center previously used as pasture was selected for this study. The soil is classified as a Waukegin silt loam and is typical of soil in urban areas of the Twin Cities. To prepare the land for the study, the original vegetation was stripped and the site was graded to a uniform slope of 5% and then compacted to simulate an urban setting. Kentucky bluegrass was sodded in the fall of 2003 and uniformly managed during 2004 prior to initiating treatments. Twenty four individual plots were constructed by installing four inch plastic edging around the perimeter of each plot area. At the base of the plot, water is funneled to a metal trough. The dimensions of each plot are 8 ft in width and 24 ft in length, but because of the fun-

neling at the base of the plot, the actual runoff area is approximately 184 ft². A plastic tube at the base of the trough is used to direct the runoff water to a five gallon plastic bucket, which is located within a larger 30 gallon container to catch any overflow runoff water. After each runoff event, the volume of runoff water is measured from each plot and a subsample saved for soluble and total P determination. Total P analysis is not yet complete and therefore only soluble P concentrations and runoff are presented in this report.

Eight treatments are currently being evaluated:

1. Control (no fertilizer applied), clippings returned
2. 1N, 0P, 0.5K (1 lb N and 0.46 lb K₂O/1000 ft² applied 3 times per yr), clippings returned
3. 1N, 0.33P, 0.5K (1 lb N, 0.33 lb P₂O₅, and 0.46 lb K₂O/1000 ft² applied 3 times per yr), clippings returned
4. 1N, 1P, 0.5K (1 lb N, 1 lb P₂O₅, and 0.46 lb K₂O/1000 ft² applied 3 times per yr), clippings returned
5. Control (no fertilizer applied), clippings removed
6. 1N, 0P, 0.5K (1 lb N and 0.46 lb K₂O/1000 ft² applied 3 times per yr), clippings removed
7. 1N, 0.33P, K (1 lb N, 0.33 lb P₂O₅, and 0.46 lb K₂O/1000 ft² applied 3 times per yr), clippings removed
8. 1N, 1P, 0.5K (1 lb N, 1 lb P₂O₅, and 0.46 lb K₂O/1000 ft² applied 3 times per yr), clippings removed

Prior to fertilizer treatments, soil samples from each plot were collected at the 0-3" and 3-6" depths. Fertilizer was applied on Sept. 19, 2004, Oct 16, 2004 and May 31, 2005. These rates of P are typical for establishing turf. Starting in Sept. 2005, P rates will be reduced to one third of the rates listed above to more realistically simulate formulations for established turf previously used before the P fertilizer restrictions. In 2004, clipping samples were collected on September 30 and October 18 for phosphorus determination. The weight of the clippings was measured only for the clippings removed treatments on the second sampling date. Starting in 2005, clippings will be weighed for the

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entire plot for those plots where clippings are removed. For the plots where clippings are returned, only a small area in the middle of each plot will be weighed and then returned. The remainder of the plot will then mowed with a mulching type mower. On a monthly basis, a sub-sample of clippings will be saved for P determination.

Results to Date: Runoff data have not been statistically analyzed and therefore results should be considered preliminary at this point in time.

Initial Soil Tests: Soil test values for the runoff plot prior to fertilizer application are presented in Table 1. These soil test results are typical of those in the Twin Cities area for turf - near neutral pH, medium organic matter and potassium, and high phosphorus.

Clipping Measurements: Clipping phosphorus concentrations and yields are presented in Table 2. There was a trend for P fertilizer application to increase P concentrations in the clippings at the second sampling date. All P concentrations in clippings were above the critical level of 0.26%P. (Continued on Page 21)

Table 1

Initial Soil Test Results for the Runoff Plots, September 2004

Soil Depth	pH	Organic Matter (%)	Bray P1 (ppm)	K (ppm)
0-3"	6.8+ 0.2	4.4+0.7	27+8	115+21
3-6"	7.0+0.2	2.9+0.6	20+5	87+17

Table 2

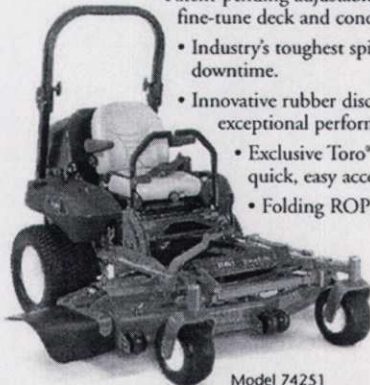
Treatment Effects on Clipping P Concentrations

Treatment	Clippings	9/30/2004	10/18/2004
Fertilizer lbs N, P205,K2O / 1000 ft ²		% P	% P
0, 0, 0	Returned	0.41	0.33
1, 0, 0.5	Returned	0.36	0.32
1, 0.33, 0.5	Returned	0.44	0.40
1, 1, 0.5	Returned	0.40	0.42
0, 0, 0	Removed	0.44	0.37
1, 0, 0.5	Removed	0.39	0.37
1, 0.33, 0.5	Removed	0.36	0.36
1, 1, 0.5	Removed	0.39	0.40

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Soluble Phosphorus Concentrations in Runoff Water: Concentrations of soluble P in runoff water before treatments were initiated ranged from 0.79 - 2.54 ppm (Table 3). During fall runoff events (10/3/04 - 10/29/04), there was a trend for higher P concentrations in runoff water when P fertilizer was used except for the control (0,0,0) treatment when clippings were removed. The high level of P in this treatment is believed to be due to dead worms, which sometimes accumulated in the runoff water. During winter and spring snow melt (2/5/05 - 3/21/05), there was a distinct trend for increasing P concentrations in runoff water with the highest P fertilizer rate regardless of clipping management.

Soluble Phosphorus Runoff Estimates: During the fall (10/3/04 - 10/29/04), soluble P losses from runoff were low for all treatments due to low volumes for runoff water (Table 4). During winter and spring snowmelt, however, runoff volumes were large and P losses, tended to increase with increasing P fertilizer rate with little effect due to clipping management. The greatest risk of P losses appears to be during snowmelt when the ground is still frozen and runoff volumes are large.

Additional measurements over the next two seasons are needed before conclusions about P fertilizer use can be drawn.

Flow weighted soluble P concentrations in runoff water as affected by treatment

Treatments		Sampling Period		
Fertilizer lbs	Clippings	9/16/04*	10/3/04	2/5/05
N, P2O5, K2O /1000 ft2		9/16/04*	-10/29/04	3/21/05
		ppm P	ppm P	ppm P
0, 0, 0	Returned	0.82	0.66	1.03
1, 0, 1	Returned	0.81	1.30	1.50
1, 0.33, 1	Returned	0.61	2.49	2.40
1, 1, 1	Returned	2.54	3.89	4.43
0, 0, 0	Removed	1.81	4.21	1.84
1, 0, 1	Removed	2.09	1.86	0.98
1, 0.33, 1	Removed	0.81	1.84	1.58
1, 1, 1	Removed	0.79	2.05	4.25

* Before treatments were initiated.

Table 4

Soluble phosphorus runoff as affected by treatment

Treatments		Sampling Period		
Fertilizer lbs	Clippings	9/16/2004*	10/3/04	2/5/05
N, P2O5, K2O /1000 ft2		9/16/2004*	- 10/29/04	- 3/21/05
		lb P/A	lb P/A	lb P/A
0, 0, 0	Returned	NA	0.001	0.176
1, 0, 1	Returned	NA	0.008	0.229
1, 0.33, 1	Returned	NA	0.012	0.329
1, 1, 1	Returned	NA	0.009	0.952
0, 0, 0	Removed	NA	0.002	0.242
1, 0, 1	Removed	NA	0.008	0.260
1, 0.33, 1	Removed	NA	0.009	0.345
1, 1, 1	Removed	NA	0.011	0.639

* Before treatments were initiated.

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Phosphorus Fertilizer Re-Training Program

Name: (please print) _____

Golf Course Name: _____

Date of Initial Training: _____

By signing this document, I am stating that I have read the above document about the fate of P fertilizer applied to turfgrass and am thereby fulfilling my requirements for re-training for the Phosphorus Fertilizer Training Program which is required by Minnesota state law for golf course personnel to be exempt from the legislation.

Signature: _____ Date: _____

Send to:

MGCSA
Phosphorus Fertilizer Re-Training Program
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Minnetonka, MN 55305-2018