

Effect of Urease Inhibitors Applied to Urea When Fertilizing Orchardgrass

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Objective

Many livestock owners use the granular form of urea nitrogen during late summer and fall to increase forage growth for “stockpiled” forage. Livestock are then allowed to graze the “stockpile” at a later date when other forages no longer are growing or available. This practice extends the grazing season and reduces the need for higher priced stored feed. Because urea nitrogen is very susceptible to volatilization losses under high temperature and humidity conditions, this study was conducted to determine the effects of adding urease inhibitor products, which stabilize nitrogen, to the urea before applying it to the forage. The study was to determine any difference in dry matter accumulation between treatments and detect changes in quality characteristics of the forages.

Background

Crop Year:	2015	Previous Crop:	Permanent Mixed Grasses
Location/Town:	Woodsfield, OH	Tillage:	None
County:	Monroe	Soil Test:	pH-6.2, P-26 ppm, K-68 ppm
Soil Type:	Zanesville Silt Loam (ZnB)	Rainfall:	0.05 inch within 6 days of treatment
Drainage:	Natural	Rainfall:	1.10 inch within 30 days of treatment
Nitrogen:	100 lbs. granular Urea (46 actual N) App. Date: 8/3/15	Harvest Date:	12/2/15

Methods

This was a randomized complete block design with four (4) treatments, including a control, and four (4) replications of each treatment. Each plot was 6 feet by 20 feet. The site was a predominately orchardgrass hay field and the soil test results were pH, 6.2; P, 26 ppm; K, 68 ppm; Ca, 969 ppm; and Mg, 209 ppm. The field was mechanically harvested nine days prior to treatments and natural regrowth had occurred. The control plots received no urea or urease inhibitor. For the other treatments, urea nitrogen was broadcast on the surface as follows: 100 lbs. urea/A; 100 lbs. urea/A plus Agrotain® added at the labeled rate of one gallon* per ton of fertilizer; and 100 lbs. urea/A plus NutriSphere-N® added at the labeled rate of one half gallon per ton of fertilizer. The plots were harvested on December 2, 2015 to a height of three inches above ground level utilizing 2' x 2' subsamples from each plot. Each subsample was weighed fresh, and then taken to a laboratory for forage analysis. Each of the 16 samples was quality tested for Crude Protein (CP), Acid Detergent Fiber (ADF) and Total Digestible Nutrients (TDN).

(*Note-A newer formulation “Agrotain Advanced” is now available at about twice the cost of Agrotain, the product used in this study, but the new label rate is ½ the amount (2 quarts) per ton instead of 1 gal./ton so costs per application are nearly identical.)



Results

Dry matter (DM) yields averaged 1630 pounds per acre for the plots where no N was applied, 1899 pounds for the plots with 46 pounds of urea N applied, 2141 pounds for the plots with 46 pounds of urea N with Agrotain® applied and 1912 pounds for the plots with 46 pounds of urea N with NutriSphere-N applied. While there was no significant difference in the treatments ($P < 0.05$) for quantity, there was a significant difference in CP content in the treatments. As shown below in Table 1, the CP in the Urea/Agrotain treatment, the Urea only and the control which received no treatment were greater than the Urea/NutriSphere treatment. There was a trend of higher yields with the addition of urease inhibitor products above both the urea only and control plots, but no statistical difference in ADF and TDN.

Table 1.

Treatment	Lbs. DM/A	Lbs. DM/A above control	CP%	ADF%	TDN%
Control	1630	0	13.16	39.65	60.28
Urea	1899	269	13.15	39.95	60.05
Urea+Agrotain	2141	511	14.58	40.45	59.70
Urea+NutriSphere	1912	282	12.54	42.53	58.25
LSD	NS		0.95	NS	NS

Summary

Urea nitrogen can be very susceptible to volatilization when temperatures and humidity are high and no rainfall occurs to move the broadcast N into the soil in a timely manner. Rainfall after the treatments were initiated, in this study, was nearly non-existent (0.05 in.) for 6 days making the potential to lose N to volatilization very high. On day seven a rain event (0.3 in.) occurred over the plots. Rainfall, during the first 30 days after treatments, totaled only 1.10 inches.

Previous research conducted by Penrose (2014), showed a similar increase in dry matter accumulation using Agrotain urease inhibitor even though there was no significant difference in the treatments at the ($P < 0.05$) for quantity. There was significant difference in crude protein between urea (8.53%) and urea with Agrotain (8.31%) when compared to the control (6.77%) in that study.

Less than expected total growth accumulation was observed in all plots. This may be due to lack of adequate moisture until mid-September, and by then length of daylight hours are diminishing and forage growth is typically slowing down. During most growing year's producers would expect 1000+ lb. of additional growth from 100 lbs. of urea. Normal, to above normal, rainfall amounts occurred after mid-September until harvest.



Additional forage growth, above control amounts, did not pay for the urea and urease inhibitors in this study. Adding nitrogen to the stockpiled forage at a rate of 100 pounds of urea per acre cost \$20.00 per acre when urea is \$400/ton. Including Agrotain at the labeled rate adds \$2.75 per acre for a total of \$22.75/A and including NutriSphere at the labeled rate adds \$3.39 per acre for a total of \$23.39/A. These amounts do not including application costs that would be incurred.

Using a hay price of \$0.04/lb. (\$70/ton as fed weight, = \$80/ton DM) as a comparison to arrive at a value for the forage growth in this study, the application of urea lost (-\$9.24)/A; urea + Agrotain was (-\$2.31)/A and urea + NutriSphere was (-\$12.11)/A.

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