IMPROVING ALFALFA PRODUCTION IN WISCONSIN WITH SULFUR AND POTASSIUM FERTILIZER

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Abstract

The longevity and quality of an alfalfa stand is an essential component for Wisconsin's dairy rotations. A study was developed to determine the effects of sulfur and potassium applications on the growth and development of alfalfa stands. The objectives of this study were to determine the effect of i) S fertilizer rate, timing and form on alfalfa yield, ii) recommended or no K fertilizer application on alfalfa yield on soils testing optimum or low for K, and iii) S and K application on soil test S and K levels throughout the soil profile. Plots were established on three silt loam soils in 2011 and were evaluated through 2013. The experimental design was a randomized complete block with four replications. Treatments included annual applications of 0, 25, and 75 lb S/a as gypsum or 75 lb S/a as elemental sulfur applied in the first year at 0 or 240 lb K_2O/a applied annually.

Fertilizer treatment effects on alfalfa yield, S and K concentrations in the harvested plant, and S and K removal in the harvested biomass were measured throughout the study. In 2012, there was no significant treatment effect on alfalfa yield at all three locations. However, in 2013, 240 lb K_2O/a significantly increased cumulative yield at all locations except Lancaster. Harvested plant S or K concentrations were significantly greater where the nutrient was applied with the exception of K concentration at Lancaster in 2012. Sulfur application, regardless of rate, timing or form, significantly increased S removal at all sites except for the application of elemental S at Lancaster which had similar or lower S removal than where no S was applied. Application of K significantly increased K removal at all sites in 2013 along with Freedom and Marshfield in 2012. Gypsum applied annually at 75 lb S/a significantly increased spring 2014 soil test S deeper within the soil profile, to 24 in. at Lancaster and Marshfield and to 36 in. at Freedom, but did not result in greater yield than where 25 lb S/a was annually applied as gypsum. Spring 2014 soil test K levels in the 0 to 6 in. depth at all locations and the 6 to 12 in. depth at Marshfield were significantly greater where 240 lb K_2O/a was applied annually compared to where no K was applied. Annual applications of potash significantly increased soil test K in spring 2014 compared to spring 2011 at Marshfield and Freedom. Soil test K levels, 0 to 6 in., decreased significantly where no K was applied. At Lancaster and Marshfield, soil test K levels declined during the course of the study to a depth of 24 in. when no K was applied. The data demonstrates that failure to apply K to alfalfa will result in soil test K levels declining throughout the soil profile even when no significant yield increases are obtained with application of potash.

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