

## **Impact of Potassium Fertilization, Harvest Frequency, and Grazing Management in Alfalfa Persistence across the Southeastern U.S.**

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It has been well-documented in the literature that the addition of P and K fertilizers can increase alfalfa yield and persistence. However components associated with K-induced dry matter yield variation in regards to agronomic performance in the southeastern U.S. is not well-understood. The objective of this study is to determine the impact of K fertilization and harvest regime on forage yield, plant persistence, forage quality, and yield components of alfalfa. The study is being conducted at the Henry H. Leveck Animal Research Farm at Mississippi State University. Plots measure 1.8 m x 4.6 m and were fertilized at planting according to soil test recommendations for lime, phosphorous, boron and zinc. Alfalfa was drilled at a rate of 20 lb pure live seed (PLS) per acre in a prepared seed bed. The experiment was a randomized complete block design arranged as a split-plot with three replications. The main plots were harvest regimes at four maturity stages and the subplots are the potassium (K<sub>2</sub>O) application rates. Alfalfa was harvested at four maturity stages [bud and three bloom stages (1/10, 3/10 and 5/10)]. Muriate of potash (0-0-60) was applied at a rate of 0, 30, 60, 90, and 120 lb/ac in split applications (before first cut, after second cut, and in the fall before last cut). Alfalfa yield was determined by harvesting the entire plot five times during the 2016 growing season. A herbage sub-sample was collected from each plot for moisture determination and subsequent mineral and forage quality analysis. Samples were dried at 131 °F for a minimum of 72 hours to determine dry matter concentration. Dried samples were ground to pass a 1-mm screen and analyzed for nutrient values. Estimate of nutrient removal (K, P, Ca, and Mg) was calculated by multiplying the yield at each harvest by the concentration of nutrients in the forage. Ground samples were used to determine nutritive value [Crude Protein (CP), Acid Detergent Fiber (ADF), and Neutral Detergent Fiber (NDF)] using a Foss 2500 NIR instrument and the 2017 Legume Hay equation developed by the NIRS Forage and Feed Testing Consortium (Hillsboro, WI). Greater seasonal biomass production was only observed at the 5/10 bloom stage in 2016. Potassium application rates did not impact seasonal yield production in 2016 or forage quality parameters (CP, ADF, and NDF). A significant growth stage x harvest date impacted CP ( $P < 0.0001$ ), ADF ( $P < 0.0001$ ), and NDF ( $P < 0.0001$ ). Potassium application rates impacted tissue concentrations for K ( $P < 0.0001$ ), Ca ( $P < 0.0001$ ), and Mg ( $P < 0.0001$ ). A significant growth stage x harvest date impacted plant nutrient concentrations for K ( $P < 0.0001$ ), P ( $P < 0.0001$ ), Ca ( $P < 0.0001$ ), and Mg ( $P < 0.0001$ ).