

Quality of Alfalfa Hay as Influenced by Phosphorus & Potassium Fertilization

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In two field and laboratory experiments, research was conducted to determine impacts of nutrient applications on alfalfa hay quality and nutrient value at Irrigated Research and Extension Center near Prosser, WA. The phosphorus (P) study P soil tests levels were 6.7 and 5.7 ppm at the beginning of 2019 and 2020, respectively (Olsen P test) in 2019 and 2020. The potassium (K) study was conducted on a soil test level of 85 and 78 ppm K in 2019 and 2020, respectively. Applying P increased protein, NDFD 48, and Net Energy for Lactation (NEL) concentration and decreased ash and lignin concentration. Over five seasonal alfalfa cuttings, phosphorus increased protein higher in the first and second cuttings. Applying 240 lb. P_2O_5 increased total nutrient value of hay by \$25 and \$42 ton^{-1} averaged over cuttings and first cutting, respectively. The total nutrient value increases over control was 382, 519, 930 and 1,004 dollars $acre^{-1} year^{-1}$ when 30, 60, 120, 240 lbs. P_2O_5 $acre^{-1}$ was applied, respectively. Applying 320 lb K_2O $acre^{-1}$ increased protein concentration 1% when averaged over cuttings. Although not statistically significant applying 320 lb K_2O $acre^{-1}$ increased nutrient value of hay by \$12 ton^{-1} . Total nutrient value in \$ $acre^{-1} year^{-1}$ increase over the control was 121, 372, 407, 534, 722 when 40, 80, 160, 240, 320 lbs. K_2O $acre^{-1}$ was applied, respectively. Nutrient values responded more to P at 8 ppm than K at 82 ppm in second- and third-year alfalfa. Relative Feed Value (RFV) is a poor indicator of alfalfa nutrient value because RFV failed to detect value increases of protein and NDFD 48. Both protein and NDFD 48 directly impacted dairy animal digestibility and fiber fill and are not included in RFV calculations. The impact of negative forage quality parameters, ash and lignin, in alfalfa hay economic value can be partially mitigated through nutrient applications of P and K and viewed on a land area basis.