News From Alfalfa Nutrition Research

NORCROSS, Ga. — Adequate potassium and phosphorus nutrition are critically important to alfalfa productivity under periodic grazing or hay harvesting.

Carbohydrate assimilation and transport within the alfalfa plant are decreased under potassium deficiency. Potassium is also important for proper nodulation and nitrogen fixation. Alfalfa roots are the main storage organ for starch that is used for regrowth of the shoots. Alfalfa root nitrogen is also mobilized to regrowing shoots, because defoliation (harvest) severely limits uptake of nitrogen by roots and nodule activity.

The primary sources of nitrogen for regrowth during the first two weeks after harvest are root protein and amino acid pools.

A Purdue University project directed by Dr. Jeff Volenec and colleagues, with partial support from the Foundation for Agronomic Research, is studying the interactions of phosphorus and potassium on alfalfa yield and stand persistence. The study is providing new insights into the mechanisms by which alfalfa responds to phosphorus and potassium. It is also monitoring numerous physiological and biochemical (starch, sugar, protein) attributes of the roots thought to be critical to rapid regrowth and winter hardiness.

Nutrients released from clay minerals and soil organic matter sources during the winter months help meet the needs of the first cutting, but as soil test levels decline, yield levels are reduced. This effect has increased each year that the study continues, as soil test levels on the low fertility plots are further depleted.

Over the first two years, plant population has decreased by 50 percent, but so far there has not been a significant difference among the phosphorus and potassium treatments. Higher phosphorus and potassium levels reduced the number of shoots per unit area, indicating that the higher yields are not due to increased shoot density, but are rather due to more dry matter produced per shoot.

Slight decreases in forage quality components have sometimes been observed in the high fertility plots, but the increased yield from phosphorus and potassium application produces more total protein and total digestible nutrients (TDN). Low phosphorus and potassium nutrition did reduce root organic reserves in some cases, and the researchers expect stand persistence to be affected in future years for the low phosphorus and potassium plots. Higher fertility will enable the shoots per unit area to be maintained even though the number of plants per unit area declines. This will ultimately increase stand longevity and may help explain why adequate phosphorus and potassium nutrition are essential to alfalfa productivity.

Better understanding of the physiological effects of phosphorus and potassium management will help explain the yield response and will provide new insights into the best management practices for fertilizing alfalfa for optimum yield and increased stand longevity.