

Have you ever wondered if alfalfa responds to phosphorus applications like corn, wheat, or grain sorghum?

There have been several trials across the state regarding phosphorus applications on alfalfa, but there are two studies from southeast Kansas that answer that question: a 3-year study in the late 1980s and a 2-year study in the early 1990s. Both studies were established at the Southeast Agricultural Experiment Station near Parsons, KS. The research sites were a Parsons silt loam with phosphorus soil test levels below 10 ppm. Phosphorus treatments in the 3-year study were 0, 40, 80, 120 pounds  $P_2O_5$  per acre that were applied in the fall; while the treatments in the 2-year study were 0, 40, and 80 pounds  $P_2O_5$  per acre and they were applied in the spring.

Over the three-year study, total alfalfa forage yields for the 0, 40, 80, and 120 pounds  $P_2O_5$  per acre treatments were 9.7, 12.4, 13.2, and 14.2 tons per acre, respectively. While 9.7 tons per acre for the 0 phosphorus treatment was an adequate forage yield for the three year total, the initial 40 pounds of phosphorus increased total tonnage by 2.7 tons per acre, or a 28 percent increase. The 80 pounds phosphorus treatment increased the yield by another 6 percent and the 120 pounds phosphorus treatment increased tonnage by 8 percent over the 80 pounds treatment. Overall, there was a 4.5 tons per acre difference between the 0 phosphorus treatment and the 120 pounds  $P_2O_5$  per acre treatment. The first hay cutting of the season responded the most to the initial phosphorus application, but generally, there were slight yield increases for the remaining cuttings compared to the 0 phosphorus treatment. (Two years of the study there were 3 cuttings per year and one year there were four cuttings.)

For the two-year study, total alfalfa forage yields for the 0, 40, and 80 pounds  $P_2O_5$  per acre treatments were 9.5, 12.7, and 13.2 tons per acre, respectively. There was a 3.2 tons per acre (34 percent) increase for the initial 40 pounds of phosphorus over the 0 phosphorus treatment. With the 80 pounds  $P_2O_5$  per acre treatment there was an additional 0.5 tons per acre (4 percent) increase over the 40 pounds  $P_2O_5$  per acre treatment. Overall, there was a 3.7 tons per acre difference between the 0 phosphorus treatment and the 80 pounds  $P_2O_5$  per acre treatment. In this two-year study, there were four and five cuttings per year and there was a significant yield increase for each cutting with the 40 pounds  $P_2O_5$  per acre treatment over the 0 phosphorus treatment.

What's the bottom line?

Alfalfa responds to phosphorus applications, especially when phosphorus soil test levels are low, just like corn, wheat, and grain sorghum. And if phosphorus is needed, it can be applied in the fall or spring. There are approximately 12 pounds of  $P_2O_5$  removed with every ton of alfalfa forage that's removed. So, adequate phosphorus applications need to be made, otherwise alfalfa will reduce phosphorus soil test levels rapidly. The early cuttings tend to respond more to phosphorus because the soils are cooler and wetter, but with a phosphorus-responsive soil the later cuttings may respond also.

For more details about this research see:

Kansas Fertilizer Research-1988. Report of Progress 561. P. 56-58. K-State Research and Extension.  
Kansas Fertilizer Research-1989. Report of Progress 587. P. 52-54. K-State Research and Extension.  
Kansas Fertilizer Research-1990. Report of Progress 618. P. 63-64. K-State Research and Extension.  
Kansas Fertilizer Research-1992. Report of Progress 670. P. 59-61. K-State Research and Extension.  
Kansas Fertilizer Research-1993. Report of Progress 697. P. 51-53. K-State Research and Extension.

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