

IMPACTS OF IRRIGATION TECHNOLOGY, DEFICIT IRRIGATION, AND GENETICS ON ALFALFA PHOSPHORUS AND POTASSIUM USE

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ABSTRACT

Alfalfa is exceptional at obtaining nutrients from the soil with its deep tap root. However, with its ability to consume vast amounts of phosphorous and potassium more is used than what is made available each year. This results in the need of nutrient management plans. With the continuing of the drought, nutrient management becomes more difficult. Irrigation management, drought tolerant genetics, and sprinkler technology can play an important role in nutrient management and affect financial outcomes of producers. Generally, there are two ways to increase profits which are, maximize yields, or reduce input cost. Deficit irrigation almost always leads to yield loss in alfalfa, which means a loss of income. That leads to a plan to reduce input cost. Fertilizer cost can be a large portion of a producer's budget.

This study looked at the possible effects of sprinkler irrigation technology, deficit irrigation, and drought tolerant genetics, on alfalfa uptake of phosphorous and potassium. Sprinkler technologies consisted of mid elevation sprinklers (MESA) and the following low elevation sprinklers, Nelson Advantage (LENA), precision application (LEPA), and spray application (LESA). Also tested was a mobile drip irrigation system (MDI). Deficit irrigation rates were full irrigation or 100% of ET, a 25% reduction, and a 50% reduction. Ladak II was chosen as the drought tolerant variety of alfalfa with a common "conventional" variety to compare.

At two sites in Utah full irrigation led to the highest uptake of potassium and phosphorous with relatively no little reduction in uptake in with a 25% reduction of applied water. Genetics were not consistently affecting the uptake of nutrients at different sites. Cedar City 2021 conventional variety had a higher uptake of potassium but no effect on phosphorus. Logan 2020 conventional variety had a significantly higher uptake of phosphorus but not potassium. The MDI sprinkler technology consistently had the lowest uptake of phosphorous and potassium in all site years.

Full irrigation tends to cause the most uptake in alfalfa. When applying deficit irrigation strategies, it would be beneficial to reevaluate fertilizer plans to meet what would be uptake by the plant. Sprinkler technology (MDI) is also significant enough to considers when making fertilizer applications based on sprinkler technology.