

EVALUATION OF CONSTANT AND REGULATED DEFICIT IRRIGATION IN ALFALFA: A TWO-YEAR FIELD STUDY IN NEVADA

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ABSTRACT

Alfalfa (*Medicago sativa* L.) is Nevada's leading cash crop, but its high evapotranspiration demand requires substantial irrigation. Water scarcity challenges, driven by Nevada's arid climate, climate change, groundwater depletion, and prolonged droughts, underscore need for more sustainable irrigation practices. Experiments conducted at the University of Nevada, Reno, Valley Road Field Lab, during the 2023-2024 growing seasons examined impacts of two deficit irrigation (DI) strategies on dry yield of two alfalfa varieties (Ladak II, marketed as drought tolerant; Nexgrow 6516R, marketed as highly productive). DI strategies were 1): Constant (C) fraction of Full Irrigation (FI) amount required to fully satisfy crop the water demands, and 2): Applying a variable fraction of FI that is Regulated (R) based on crop sensitivity to water stress during its different growth stages. Five (5) irrigation treatments were applied with a linear move irrigation system equipped for variable rate irrigation: FI, mild Constant DI (80% of FI), moderate Constant DI (60% of FI), mild Regulated DI (100% of FI during the first half of a cutting period, when the crop is more sensitive to water stress, and 60% of FI during the second half, when the crop is less sensitive to water stress), and moderate Regulated DI (80% of FI during first half of cutting period and 40% of FI during second half). Results showed that the 60% Regulated Deficit Irrigation (DI) treatment significantly reduced yield by ~2.45 Mg/ha compared to FI ($p < 0.001$). However, yields from the 80% Constant and Regulated DI treatments were comparable to FI, with no significant differences. The Ladak II variety showed an estimated yield increase in 2024 compared to 2023. These findings suggest that the Regulated DI approach can be advantageous under a mild reduction of 20% in the seasonal water budget of alfalfa, but not under more severe reductions in the water budget.

Key Words: Alfalfa, constant deficit irrigation, regulated deficit irrigation, yield.

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