

Effects of Irrigation Frequency & Cutting Schedules on Yield, Crop Water Productivity & Forage Quality of Alfalfa Variety in California's Central Valley

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Alfalfa is one of the most important perennial forage crops grown widely in the world for its economic value. It is vital to the dairy industry globally including California. It is also a high forage producing crop dependent on irrigation in semi-arid environment of California. However, under common flood irrigation practice and harvesting management associated logistic challenges, alfalfa is generally irrigated once (non-frequent irrigation: NFI) per cut (28 days basis: 28d), and this irrigation practice may limit alfalfa from attaining its yield potential. A field study was started at USDA-ARS Agricultural Sciences Center, Parlier, CA in 2021 to examine the effect of irrigation frequency by cutting schedule combination treatments on yield, crop water productivity (CWP) and forage quality of alfalfa variety. A split-plot design with irrigation by cutting schedule combination treatments (NFI-28d cut, frequent irrigation (FI): FI-28d cut, and FI-35d) as main- and variety as sub-plot factor is used in the study. NFI treatment received one irrigation per cut (6", amount generally applied by a grower in the area) one week after cutting while the FI treatments received irrigation once a week based on evapotranspiration (ET) values. Frequent irrigation was at 110% ET level. Ten diverse varieties were tested in the study. Results of crop establishment year 2021 showed that irrigation by cutting schedules and variety treatment effects were not significant for seasonal yields and CWP. In general, response of varieties to irrigation by cutting schedule treatments were similar (average yields of varieties ranged from 16.1 to 17.8 Mgha⁻¹). Seasonal applied water use (irrigation plus rainfall) amounted 1206.1 and 1325.5 mm, for NFI and FI treatments, respectively. Seasonal dry matter yields were 16.1, 17.8, 17.6 Mg ha⁻¹, for NFI-28d (6 cuts), FI-28d (6 cuts) and FI-35d (5 cuts), respectively. NFI-28d, FI-28 and FI-35d treatments were similar in CWP achieving 13.3, 13.4, 13.3 kg ha⁻¹mm⁻¹, respectively. NFI-28d treatment produced a slightly lower seasonal yield but similar CWP as FI treatments with applied water use saving by 9%. Regardless of irrigation frequency and cutting schedules, the first three cuts contributed the most to total seasonal yields in all treatments (67, 69, and 73% in NFI-28d, FI-28d and FI-35d, respectively). Plant samples processing is underway for forage quality analysis and will be part of the presentation. Crop establishment year 2021 results showed that one irrigation per 28d cut (NFI-28d) resulted in slightly lower forage yield but similar CWP as FI-28d and FI-35d. However, yields data of multiple production years will be needed to draw a conclusion about irrigation frequency and cutting schedules impact on alfalfa's yield and crop water productivity in Central Valley of California.

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