

YIELD, WATER PRODUCTIVITY & NUTRITIONAL VALUES RESPONSE OF ALFALFA TO IRRIGATION FREQUENCY & CUTTING SCHEDULES IN CALIFORNIA'S CENTRAL VALLEY

Begna, S.¹, D. Wang¹, K. Bali² and D. Putnam³

ABSTRACT

Alfalfa is one of the most important perennial forage crops grown widely in the world and vital to the dairy industry including California. It is a high forage producing crop dependent on irrigation in semi-arid environment of California. However, under common flood irrigation practice and harvesting management logistic challenges, alfalfa is often irrigated once (non-frequent irrigation: NFI) per cut (28 days basis: 28d). 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. 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 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 varieties were tested in the study. Irrigation frequency-cutting schedule combination treatments by year interaction effect was significant on seasonal forage yield and crop water productivity. FI-28d and FI-35d cut resulted in similar yield with 8 to 10% greater than NFI-28d cut in 2021. However, in 2022 the highest yield was achieved with FI-28d, followed by FI-35d cut and the least with NFI-28d. Yield in the crop establishment year 2021 was significantly lower than production year 2022 (17.1 vs. 26.1 Mgha⁻¹). The CWP of irrigation frequency by cutting schedule treatments were similar in 2021 (13.4 kg ha⁻¹mm⁻¹) but in 2022, FI-28d and NFI-28d cut treatments resulted in the highest CWP (15.2 kg ha⁻¹mm⁻¹). In general, response of varieties to irrigation by cutting schedule treatments were similar (avg. yields of varieties ranged from 21.0 to 22.5 Mgha⁻¹). Total digestible nutrients were greater for NFI-28d cut (by 1 to 20%) than FI-28d and FI-35d cut treatments and, a similar trend was observed in crude protein in relation to irrigation by cutting schedule treatments. Regardless of irrigation frequency and cutting schedules, the first three cuts contributed the most to total seasonal yields in all treatments. Two years yield results showed that one irrigation per 28d cut (NFI-28d) to result in a slightly lower forage yield but similar in CWP as FI-35d and greater in nutritional values than both treatments. Yields and forage quality data of multiple production years will be collected to draw a solid conclusion about irrigation frequency and cutting schedules impact on alfalfa's yield, water productivity and quality in Central Valley of California.

¹Sultan Begna (Research Agronomist), Dong Wang (Supervisory Res. Soil Scientist and Research Leader),: Water Management Research Unit, San Joaquin Valley Agricultural Sciences Center, USDA-ARS, Parlier, CA 93648; ²Khaled Bali (Irrigation Water Management Specialist): Kearney Agricultural Research and Extension, University of California, Agricultural and Natural Resources, Parlier, CA 93648; ³Dan Putnam (Agronomist and Forage Specialist): Department of Plant Sciences, University of California, Davis, CA 95616. In: Proceedings, 2023 Western Alfalfa & Forage Symposium, Sparks, NV, December 12-24, 2023, (<http://alfalfa.ucdavis.edu>).