Yield-Quality Tradeoff of Higher Quality Alfalfa Cultivar under Different Cutting Schedules in Californian's Central Valley

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Yield is one of the main factors for a profitable alfalfa (*Medicago sativa* L.) production although quality is second to yield in contribution to alfalfa's profitability. Producing high yields while maintaining quality of alfalfa with delayed cutting has been a challenge for producers due to the inverse relationships between yield and quality resulting from crop maturation. Cultivars with higher quality (genetically engineered reduced-lignin 'HarvXtra', and conventionally bred 'HiGest' cultivar types) have shown the potential to minimize the problem associated with delayed cutting. However, there have been few reports of these lines in semi- or non-fall dormant (FD 6-9) groups tested in a long-season environment of California. A field study was conducted in Parlier, CA in 2017-2021 to compare dry matter yield, quality, and yield-quality tradeoff of eight cultivars (2 HarvXtra, 2 Hi-Gest, and 4 Conventional). A split-plot design with cutting schedules (28 d, 35 d, and staggered with 21 d/35 d alternating) as the main-and cultivar as sub-plots plot factors. Cutting schedule and cultivar effects were significant for all measured variables, and response of cultivar types across years and cutting schedules were similar. The 35 d cutting, averaged over years and cultivar types, resulted in 16% and 10% greater yields than 28 d and staggered cutting schedules, respectively, but its nutritive value was the lowest. Hi-Gest cultivar types, averaged over years, produced the greatest yield while conventional and HarvXtra resulted in similar yields under all cutting schedules. HarvXtra and Hi-Gest, respectively, were an average of 5 to 6% and 1 to 2% greater in neutral detergent fiber digestibility (NDFD) than conventional cultivar types under all cutting schedule treatments. HarvXtra at 35d achieved similar NDFD and lignin concentration to conventional cultivar types cut at 28d indicating HarvXtra's potential in producing high yield while maintaining quality and minimizing the yield-quality tradeoff problem associated with delayed cutting. Moreover, the 'staggered' schedule, regardless of the cultivar types, offers the opportunity to providing total higher yields and higher-quality harvests than a regular 28 d schedule, minimizing the negative contribution of early (21 d) and late (35 d) cuttings have on yield and quality and hence alfalfa profitability. Adaptation of higher quality semi- and non-dormant cultivars, in conjunction with harvests (staggered and delayed) is a potential strategy that producers can use to minimize the yield-quality tradeoff challenges and to maximize the profitability of their alfalfa production.

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