



Alfalfa (*Medicago sativa* L.) is tolerant to higher levels of salinity than previous guidelines indicated: Implications of field and greenhouse studies

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Alfalfa (*Medicago sativa* L.) is the most widely grown leguminous forage crop in North America and is valued for high productivity, quality, economic value, and for dairy productivity. Alfalfa has historically been classified as moderately sensitive to saline conditions, with yield declines predicted at >2 dS/m in the saturated soil paste extract. However, greenhouse, sand tank, and field studies over the past five years have confirmed that alfalfa can be grown with limited negative effects at much higher salinity levels. A broad collection of alfalfa varieties has exhibited a range of resistance at irrigation water salinities >5 dS/m EC_w in greenhouse trials, with significant variation due to variety. USDA-ARS sand tank studies indicated similar or greater tolerances closer to 8 dS/m in the soil water, in addition to confirmation of significant varietal differences. A three-year field study on clay loam soil with applications of 5-7 dS/m EC_w irrigation water indicated normal yields and excellent stand survivability. A second field study in the same soil type with levels from 8-10 dS/m EC_w showed yield reductions of 10-15% but economic yields were still achieved at those levels. Field and greenhouse studies were conducted with mixed salt saline sodic waters typical of the San Joaquin Valley of California. Field evaluation of variety performance was subject to greater variation due to secondary salinity-soil interactions including water infiltration and crusting problems, not only salinity per-se. Thus, adequate irrigation water availability to the crop may be as important as salinity in impacting yields under field conditions. Once established, the deep-rooted characteristics of alfalfa enable utilization of deeper subsurface moisture, even at moderate to high salinity levels, as documented by USDA lysimeter studies. Significant advantages to salinity-tolerant varieties have been observed. It will be important to consider specific management factors which may enable the successful production of irrigated alfalfa with use of saline (up to 8 dS/m EC_w) irrigation water, including careful water management during stand establishment, prevention of crusting, and agronomic practices to promote water infiltration. Irrigated regions looking for economically-viable crop species to grow under saline conditions may consider alfalfa grown utilizing appropriate methodologies, including salt-tolerant varieties and agronomic practices to mitigate the secondary effects of soil salinity and sodicity.