Perennial Legume Response to Drought

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Our research in Minnesota has shown that moisture deficits during summer reduce yield, increase forage quality, and enhance persistence of perennial legumes like alfalfa and red clover relative to well watered controls. In this study, we determined the effect of irrigation on the forage yield and forage quality of kura clover (*Trifolium ambiguum* M.B.), compared to alfalfa (*Medicago sativa* L.), red clover (*Trifolium pratense* L.), birdsfoot trefoil (*Lotus corniculatus* L.), and cicer milkvetch (*Astragalus cicer* L.). Field research was conducted over four years on a sandy soil in central Minnesota. Kura clover is relatively new legume in the Midwest and has great potential as a persistent forage legume. Previous investigations have indicated that kura clover is tolerant of drought but its relative drought tolerance compared to other forage legumes was not known. We found that Kura clover was consistently among the lowest yielding legumes under irrigation or drought while alfalfa was consistently among the highest yielding. At a mid summer harvest when regrowth occurred under moisture deficit stress, forage yields of kura clover, alfalfa, red clover, birdsfoot trefoil, and cicer milkvetch were increased 1.7 (290%), 1.6 (189%), 1.5(184%), 2.0 (233%), and 1.3 (176%) Mg ha^{-1}, respectively, by irrigation compared to the unirrigated control. Populations of kura clover increased from 90 to over 300 plants m^{-2} during the experiment and were not affected by irrigation treatments. Populations of other legumes declined. Red clover and birdsfoot trefoil populations were greater for the irrigated than the non irrigated control. Irrigation decreased alfalfa, birdsfoot trefoil, and red clover forage quality at a July harvest compared to a non irrigated control . This was related to delayed maturity and increased leafiness. However, kura clover forage quality was similar for an irrigated and non irrigated control likely because kura clover forage consisted of only leaves at the July harvest. While moisture deficits decreased forage yield of kura clover, belowground root and crown mass increased. We concluded that kura clover responds to moisture deficits in the Midwest by reducing herbage grown and accumulating carbon below ground in roots, crowns, and rhizomes.

References

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