Use of Phenotypic Tools in Quinoa under Drought and Heat Conditions

Quinoa is an Andean crop that has earned special attention worldwide due to its nutritional and health benefits and its ability to be productive in marginal agroenvironments. However, quinoa adaptation to dryland farming systems is challenged by high temperatures combined with arid conditions.

In a new Crop Science article, researchers evaluated 112 quinoa genotypes under high heat conditions. Of these, eight genotypes were selected and planted in four environments in the Pacific Northwest. Myriad physiological measurement tools and spectral reflectance indices were collected as indicators for heat and drought tolerance under irrigated and non-irrigated conditions.

The team found that the normalized difference vegetation index (NDVI) was the most accurate spectral reflectance index for predicting drought tolerance and grain yield in quinoa while leaf greenness index and grain yield were important parameters for identifying quinoa heat tolerance. Of the genotypes adapted to the Pacific Northwest, QQ74, Baer, and Pison were identified as having the greatest heat tolerance.

The identification of new heat- and drought-tolerant germplasm in quinoa will allow for the possible expansion of quinoa production to hotter and drier environments as well as improved resilience of quinoa to fluctuations in climate. Heat-tolerant quinoa varieties will provide more tools for farmers interested in diversifying their current cropping system and market opportunities.

Adapted from Hinojosa, L., N. Kumar, K. Gill, and K. Murphy. 2019. Spectral reflectance indices and physiological parameters in quinoa under contrasting irrigation regimes. Crop Sci. 5:1927–1944. View the full open access article online at http://dx.doi.org/10.2135/cropsci2018.11.0711

doi:10.2134/csa2019.64.S044

Potassium Affects Alfalfa Yield, Quality, and Root Traits

Potassium fertilization of alfalfa is important for maintaining yields but can have negative consequences on forage quality: a tradeoff that could vary depending on cultivar and growing environment. Moreover, reports of potassium fertilization on stand persistence have been inconsistent largely as a result of poor understanding of how potassium influences root biomass and architecture, pathogen resistance, winter survival, and other drivers of stand persistence.

New research in Agronomy Journal reports on the effects of potassium fertilization on forage yield and quality responses and belowground traits that relate to stand persistence. The potassium responses of eight modern alfalfa cultivars grown at three locations varying in soil type were studied.

Among all cultivars, potassium fertilization increased alfalfa forage yield but decreased forage quality. The concentration of potassium increased in both forage and root tissues when fertilized at rates beyond those needed to maximize forage yield, which suggests that alfalfa exhibits “luxury consumption” of potassium. Therefore, over-fertilization is not just an economic detriment to growers, but it can also reduce forage quality enough to put lactating dairy cows at risk of milk fever. Although potassium fertilization did increase root biomass, it did not result in any differences in the root disease crown rot and had inconsistent effects on stand persistence.


doi:10.2134/csa2019.64.S043