CROP BREEDING

Heat-induced yield loss of quinoa

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Climate change impacts agricultural production and challenges global food security. Understanding the crop yield responses to climate factors can help enhance the climate resilience of agricultural production systems. Quinoa (*Chenopodium quinoa* Willd.) is a highly nutritious grain crop. Quinoa seeds contain an excellent balance of protein, dietary fibre, polyunsaturated fats and minerals. In addition, quinoa can be grown on marginal lands that are not currently suitable for other major crops. However, this crop is susceptible to temperatures above ~32 °C, which is a major limitation to expand the cultivation.

Malia A. Gehan of the Donald Danforth Plant Science Center and colleagues have studied the yield responses of quinoa under high temperatures. In these experiments, the quinoa yield losses under high temperatures were found to be largely due to shoot heating.

As previous studies have shown that the roots and shoots of plants might respond differently to heat stress, the authors here used temperature control systems to heat only shoots or roots, and found that shoot heating can significantly decrease yield as compared to control, while root heating did not have a substantial effect on yield. For quinoa, heating the shoots resulted in reduced production and delayed maturity, with differentially expressed transcription factors associated with flower development and flower opening. The researchers propose that under conditions of extreme heat, quinoa uses an avoidance strategy by prioritizing growth over development, with more resources allocated to tertiary panicles over main and secondary panicles.

Underutilized crops (such as quinoa) can increase the diversification of agricultural production and the quality of our diets. The present study delivers useful information for developing new nutritious and climate-resilient quinoa varieties.

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