EGU2020-2845
https://doi.org/10.5194/egusphere-egu2020-2845
EGU General Assembly 2020

Water-use efficiency of crops under drought: A global meta-analysis

Liuyang Yu, Xining Zhao, and Xiaodong Gao
Northwest A&F University, College of Water Resources and Architectural Engineering, College of Water Resources and Architectural Engineering, China (liuyangyu_11@163.com)

Crops are facing greater drought stress and are being relocated to more arid regions as the climate changes. Ranking high-yield crops according to their efficient and sustainable use of water resources under drought stress is critical for selecting suitable crops to relieve the stress on food security and water resources in dryland agricultural regions. A global meta-analysis was conducted by incorporating 907 experimental observations from 96 research studies to assess the water-use efficiency (WUE) of 40 crop species under drought stress conditions across various environments. The results showed that compared with well-watered conditions, drought stress decreased crop WUE significantly by an average of 2.8%, but the effects varied among crop species. Most (93.6%) of the variance in crop WUE could be explained by four factors and drought intensity was the most important factor (32.9%), followed by climate type (23.5%), soil texture (20.2%), and crop type (17.1%). Perennial, liana, fiber, and fruit crops displayed the largest increases in WUE under drought stress. Moreover, crops grown in semi-arid regions with medium-textured soil and a drought intensity of < 20% showed the best WUE performance relative to crops grown in other environments. The specific ranks of crops according to their WUE in response to drought across different environments were given. This study highlights factors affecting the WUE of crops in response to drought and provides high-yield crop candidates that can adapt to drought in drylands. The dataset has been made freely available and could be updated with more crop species in the future.