Intraspecific plant variation mediates the effect of crop diversity under drought stress

Akanksha Singh[1], Christian Schöb[2], and Inea Lehner[1]

[1]ETH Zurich
[2]University of Zurich

March 07, 2024

Abstract

Increasing interspecific and intraspecific diversity in agricultural systems provides promising solutions for sustainably increasing crop yield. Most research so far has focused on understanding plant–plant interactions to develop productive crop mixtures. The role of specific plant varieties in mediating such interactions is relatively understudied. Common bean is a widely cultivated crop in North Macedonia, usually grown in monocultures. Drought is one of the main yield limiting factors for beans in the country. Our study is part of a project that aims to improve bean production in North Macedonia by using measures such as intercropping. We first conducted a greenhouse experiment to determine drought tolerant bean varieties. The chosen varieties were further grown in a second greenhouse experiment with additional crop species in different species and cultivar mixtures. The aim of our study was to select plant/cultivar mixtures that result in higher bean yield and that can be trialed in farmer fields in North Macedonia. We hypothesized that the interaction of beans with the additional crop species will be influenced by water stress and by the identity of bean varieties. Overall, we recorded sorghum and chickpea presence to increase bean yield and sunflower presence to reduce bean yield, irrespective of drought stress. However, the effect of these additional species on bean yield varied across different bean varieties. This could partially be explained by variation in growth rate between varieties, where the fastest growing variety recorded the highest yield increase in crop mixtures. Our study highlights the role that crop genetic variation can play in mediating interspecific plant interactions. We suggest that to develop crop mixtures, it is not only important to consider the functional traits of the interacting plant species, but also of the different plant varieties.

Hosted file

`Singh et al.May 2021.docx` available at https://authorea.com/users/731216/articles/710377-intraspecific-plant-variation-mediates-the-effect-of-crop-diversity-under-drought-stress