Xylem tissue plays a crucial role in long-distance water transport from roots to leaves. Since hydraulic efficiency is associated with stomatal conductance, and thus indirectly with the supporting growth and photosynthetic capacity of a plant, it could also influence grain yield in crop plants such as wheat (Triticum aestivum). In addition, hydraulic properties of the stem xylem tissue could provide information about its plasticity to environmental conditions such as water deficit. Increased drought stress and reduced food production is indeed one of the most important challenges to scientists and our society. In wheat, as in most monocots, the vascular cambium is absent and the entire plant body is the product of its primary growth, meaning that the water transport capacity of the stem is determined during early growth conditions. The aim of this study was to determine how climate conditions during spring 2011 and 2012 would affect stem hydraulic conductance, plant growth, and grain yield in 40 different wheat genotypes. Wheat stems were sampled from field experiments during the early generative phase. The xylem pathway in wheat stems was investigated using transverse sections and quantitative vessel characteristics were measured using light microscopy. We applied an analysis of variance for all data of 2011 and 2012, and calculated pearson correlations between anatomical traits.

There was a significant correlation between 2011 and 2012 for the biomass, grain number per spikelet, grain weight per average spike, and the number of large vascular bundles. Anatomical characters correlated with yield parameters (e.g., biomass, grain number, and grain weight) included the number of vascular bundles, vessel area, and the number and size of parenchyma cells. Moreover, the theoretical hydraulic conductance was significantly correlated with biomass. Differences between genotypes will be analysed to identify the most productive genotypes, and how this selection could be used to increase wheat production under climate change.

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