ABSTRACT

Xylem anatomical features and non-structural carbohydrates (NSC) are the important traits that indicate several functions such as the water conduction and carbon fixation potential of plants. The present study aimed to investigate the xylem anatomical traits and NSC level for improving the understanding of the relationship of xylem anatomical traits across the diverse deciduous tree species with varying natural origins but planted in the area several decades ago. Leaves and branch twigs were taken from fully mature 47 deciduous tree species planted in Botanical Garden GCU, Lahore. Xylem anatomical traits such as arithmetic vessel diameter (D), maximum vessel diameter (D_{max}), vessel density (V_d), hydraulic diameter (D_H), theoretical hydraulic conductance (K_h), total vessel diameter (tD), and total theoretical hydraulic conductance (tK_h) were investigated. The foliage NSC i.e, soluble sugars, and starch was measured in the summer season when all the species had fully mature leaves. Across the studied species mean D and D_{max} was 35.16 µm and 40.57µm, mean V_d was 114.16 (vessel number mm^{-2}), average D_H was 137.02 µm, mean K_h was 9.19×10^{-11} kg m MPa^{-1} s^{-1}, mean tD was 530.10 µm, and mean tK_h was 8.28×10^{-6} kg m $MPa^{-1}s^{-1}$. Most of the species showed significant differences in their xylem anatomical traits. A significant and positive correlation was observed between D and D_{max}, D and D_H, D_{max} and D_H, V_d and tK_h, while a significant and inverse correlation was found between D and the number of vessels, D_{max} and V_d, V_d and D_H. Across the species, *Wrightia coccinea* 53.02 mgg^{-1} had the lowest NSC while *Juglans regia* had the highest (804.60 mgg^{-1}) NSC, the species mean NSC was 433.35 mgg^{-1}, soluble sugars were the lowest in *Wrightia coccinea* 50.70 mgg^{-1} and highest in *Juglans regia* 802.28 mgg^{-1} and the species mean soluble sugars were 431.19 mgg^{-1}. Similarly, the lowest starch content was found in *W. zeylanica* 1.90 mg g^{-1} and highest in *Dillenia indica* 4.25 mgg^{-1}, mean was 2.15 mgg^{-1}. No correlation was observed between NSC level and xylem anatomical features across the studied species. This study provides useful information about diverse species from 21 taxonomically diverse families from diverse habitats and showed the diversity of anatomical traits that were also correlated to each other as well. Further, the NSC provides insight into the species ability to have carbon reserves in the summer. Such data are useful to understand the species performance in an ex-situ site and help the establishment of new plantations.