

Preliminary Laboratory Studies to Quantify the Effect of Plant Branches on Longitudinal Dispersion

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Abstract

Many studies investigating hydrodynamics and mixing in vegetated channels simplify vegetation by modelling stems (e.g., reeds) as arrays of cylinders. This study explores more realistic plant geometries, which include stems, branches, and leaves, through solute tracing experiments. Experiments were conducted in a 12.5 m long, 300 mm wide flume using various plant configurations (Fig. 1), and longitudinal dispersion coefficients (D_x) were determined over a range of velocities (u) (Fig. 2). The results confirm the linear relationship between D_x and u and quantify the increase in dispersion caused by the plant branches.

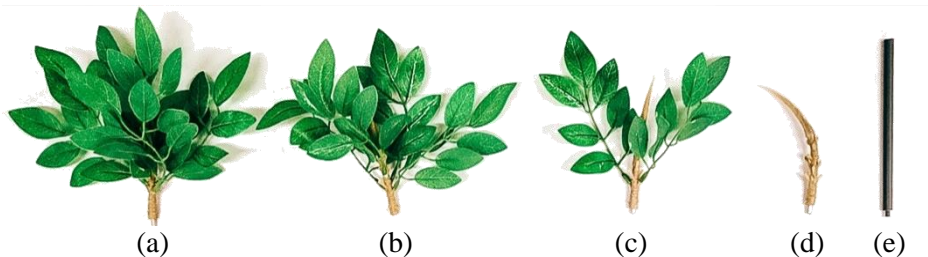


Fig. 1. Plant models used in the experiments: (a) 6 branches, (b) 4 branches, (c) 2 branches, (d) single stem (d), and (e) 8 mm cylinder.

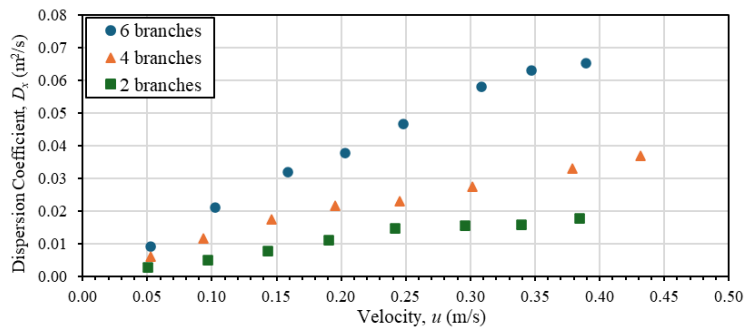


Fig. 2. Variation of the longitudinal dispersion coefficient with velocity for different plant models.