Simulation of Flow Characteristics through Emerged Rigid Vegetation over a Perturbed Bed

P. CHAKRABORTY[1] and A. SARKAR[1]

[1] School of Infrastructure, Indian Institute of Technology Bhubaneswar
Odisha 751013, India.
e-mail: pc10@iitbbs.ac.in

ABSTRACT

Flow through submerged vegetation has been an active area of research due to its immense importance in the field of flood control, storm water management, soil erosion control, natural and manmade wetlands. But in situations of lower flow rate, the vegetation emerges out of the flow rendering it the case of flow through emerged vegetation which also plays a significant role in the above mentioned cases of practical applications. In the present study, the flow through rigid, emerged vegetation over a sinusoidal bed with small amplitude has been investigated. Biot's equation of poro-elasticity has been applied to get the governing equations of the 2-D flow which have been solved analytically by the perturbation method to get the velocity field. Further, the solutions for the vertical shear stress distribution and the bed shear stress are obtained and the effects of the vegetation density on the velocity and shear stress are analyzed. The results indicate that the bed form also affects the longitudinal component of velocity significantly when the vegetation density is less. The difference between the maximum and minimum velocity of flow near the trough and crest is almost 30%.