

Influence of oil palm empty fruit bunch (OPEFB) agro-waste properties as filtration medium to improve urban stormwater

Abstract

Oil palm empty fruit bunch (OPEFB) is recommended as a filtration medium due to its fibrous characteristics and abundance as an agricultural byproduct. OPEFB is utilized to treat urban stormwater using a deep bed filter column. Urban stormwater samples were collected from Sembulan River, which flows through the Kota Kinabalu city area of Sabah, Malaysia. The samples were filtered through single and combination designs of OPEFB and river sand (RS) in mix ratios ranging between 25-75%. Each design's performance was evaluated in terms of Total Suspended Solid (TSS), turbidity, colour, temperature, Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD), and Ammoniacal nitrogen ($\text{NH}_3\text{-N}$) removal. Single medium designs demonstrated the poorest performance compared to dual mediums design. The optimum mixed design was 50:50 with ability to remove 52% color, 49% turbidity, 44% TSS, 59% COD, 84% BOD, and 94% $\text{NH}_3\text{-N}$. Further OPEFB water-washing treatment followed by a backwashing process achieved better separation results than a straightforward maintenance process. The optimized dual-filtration of stormwater was able to increase the urban stormwater quality from Class III up to Class I according to the Malaysian Interim National Water Quality Standard (INWQS), thus classified as suitable for water supply and conservation for natural environment uses.