

Abstract

Wastewater treatment is very important for the community because the demand for good quality water has reached the limits of available water. The conventional wastewater treatment methods such as activated sludge or trickling filters are very costly to operate and maintain. Natural wastewater treatment systems such as waste stabilisation ponds (algae-based ponds and/or duckweed-based ponds) are expected to be much cheaper to build as well as to operate and maintain. The treatment efficiency in the pond systems depends largely on the hydraulic flow patterns. The hydraulic characteristics of wastewater treatment plants provide the basis for modelling performance with respect to the removal of pollutants. The better the hydraulic behaviour in the pond systems, the higher the treatment efficiency will be obtained.

A laboratory scale experiment was performed at Birzeit University, Palestine to find out the effect of the hydraulic flow parameters e.g. dead-space, mixing behaviour, short-circuiting and dispersion number on duckweed-based and algae-based wastewater systems. Two continuous treatment lines of duckweed-based and algae-based pond systems were performed. Each pond system consists of four consecutive ponds of a retention time of 7 days per pond. The research focus was conducted from February-April 2000 to compare the hydraulic differences between the duckweed-based and algae-based wastewater treatment ponds.

The tracer study demonstrated that no significant change was found in the hydraulic characteristics in both algae based and duckweed based ponds. The actual retention time was found to be higher than the theoretical retention time in both ABP and DBP systems. Using the available equations in tracer literature to determine the dead-space, the result of this parameter was found to be negative in both systems. For this reason this parameter can't be compared. The dispersion number in both systems was found to be small but in the algae-based pond was smaller than the duckweed-

based pond indicating that the hydraulic flow nature of both algae-based pond (ABP) and duckweed-based pond (DBP) was dispersed-plug flow. The number of stirred tanks-in-series in the algae ponds was bigger than duckweed ponds, which concludes that the mixing behaviour in the algae ponds is slightly better than duckweed ponds. The index of short-circuiting in the algae pond was bigger than the duckweed pond.