

## ABSTRACT

One of the most important issues in Palestine is the treatment of wastewater, due to water shortage and conditions deterioration of water quality. In addition, population increase, building and industrial expansion and the lack of efficient sewage treatment facilities sufficient to serve all population cause high investment costs. So using low cost wastewater treatment systems is a good mean to help solving many environmental problems. One of these systems is duckweed stabilization pond when there is enough area to establish such treatment plants.

The goal of this research is to study the biological operations which happen in both systems Duckweed Based Pond (DBP) and Algae Based Pond (ABP) through studying the effect of, environmental factors which are degree of acidity, soluble oxygen concentration, pH and DO on the treatment degree and through studying the transformations that happen in different nitrogen compounds and to know the values of transformed nitrogen.

A laboratory and pilot experiments were done on Algae Based Pond (ABP) and Duckweed Based Pond (DBP) ponds to investigate nitrification and denitrification at different depths. The experiments measurements were carried out in the pilot plant, which was operating since 1998 at Birzeit University campus. The wastewater was pumped once a day to the holding tank ahead of the pilot plant ponds on a continuous flow basis using wastewater from the campus.

DO, pH profiles and temperature were monitored; nitrogen forms were monitored once a week during the test period to determine depth profiles of these parameters as well as nitrogen transformation.

The result of this research study showed that, rapid removal rates in organic nitrogen occurred in or near the bottom sediment layer in both algae and duckweed ponds systems. Above the bottom layer of the sediment, low rates were recorded. This might be due to ammonia volatilization and nitrogen uptake by duckweed mat and due to fluctuations in algal densities.

The average total nitrogen ( $\text{Kj-N} + \text{NO}_2^- \text{-N} + \text{NO}_3^- \text{-N}$ ) and ammonium ( $\text{NH}_4^+ \text{-N}$ ) in pond water were reduced more effectively in algae stabilization pond (60% and 82% respectively) than in duckweed stabilization pond (60% and 65%). Average nitrate concentrations in the final effluent of algae stabilization pond and duckweed stabilization pond were 0.8 and 0.6 mg  $\text{NO}_3^- \text{-N/L}$  respectively. Higher DO concentrations in ABP (DO was over saturated most of the time) did not favor higher nitrification rates over DBP (DO range was 1 to 5 mg/L).

Nitrification and denitrification rates in duckweed ponds were found to increase on going from stage to an advance stage of treatment (i.e. from one pond to another). In contrast nitrification and denitrification rates in algae ponds were decreasing on going from stage to an advance stage of treatment. However; it was noticed that nitrification and denitrification rates in algae stabilization pond are higher than in duckweed stabilization pond system.