

A Review of Feasibility of Use of Duckweed for Treatment of Sludge Water

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Abstract - The main purpose of study for this paper is conducted to examine the nutrient elimination efficiency of duckweed (*Lemna minor*) on the dissimilar wastewaters such as municipal (public) wastewater, sewage water and seafood processing plant wastewater. And also different method of elimination the efficiency of the duckweed. After the treatment of the different wastewater can be use for different purpose such as for the agriculture purpose, aquaculture purpose. Drainage water (DW) reuse is the most promising immediate and economically attractive option to secure more water for agriculture sector in Egypt. Wastewater pond systems provide reliable, low cost, and relatively low maintenance treatment for municipal and industrial discharges. However, they do have certain design, operations, and maintenance requirements. While the basic models have not changed in the 30-odd years since EPA published the last ponds manual, there have been some innovations and improved understanding of the complex biological processes at work in these systems. Additionally, new water quality requirements are either in place or about to be put in place throughout the United States, particularly relating to nutrient concentrations, that were not factored into the design specifications when many of the existing ponds were constructed. After study some paper related to this topic, finally gives other conclusion.

Key Words: duckweed, sludge water, removal efficiency, Lemna System, and Lemna minor.

1. INTRODUCTION

Generally, the advanced wastewater treatment technologies have been designed and proposed so that the treated effluent can meet the highly restrictive guidelines for disposal and/or reuse. However, these technologies are still limited to developed countries only. Advanced treatment technologies have not expanded to developing countries due to the high cost, energy requirements, difficulties of installation, operation and maintenance as well as large solids or sludge production (Mara, 2004). In addition, the guidelines of environmental protection are being stringent in developing countries day by day in recent time. To overcome these challenges, interest in natural systems for wastewater treatment is increasing day by day not only for wastewater treatment but also for conserving biological communities in developing countries (Kocaman et al., 2007). Nutrient rich

effluents when discharged into water bodies causes eutrophication, leading to algal blooms, which dies and depletes oxygen and make the water unfit for beneficial use. Production of aquatic plants to recover nutrients from the wastewater is an alternative technology to convert the nutrients into potentially useful products and prevent nutrient pollution of the environment.

In order to find a reliable. Simple and cost-effective small wastewater treatment system, an experimental research programmed on duckweed-based treatment systems was carried out. In spite of the profitable characteristics of duckweed (high productivity, high protein content, wide geographic distribution, control of negative impacts from conventional wastewater treatment ponds), the results obtained confirm that their extensive use in Italy seems difficult because of the high requirement of land area and the ceasing of growth in winter months (at least in Northern Italy). In temperate climates, a reasonable use of duckweed looks to be the production of good quality secondary effluents (BOD and SS removal) from small communities, especially in seasonal (summer) wastewater treatment plants. Another use is algae removal from facultative lagoon effluents. Nitrogen removal can only be reasonably obtained in duckweed-covered ponds with supplemental aeration. Wastewater treatment in combination with possible re-use scenarios for nutrients, energy and water provide attractive options for environmental and water resources management. At the same time such re-use oriented treatment systems can yield considerable by-products in the form of crops, fish or livestock. These by-products provide important incentives, to make the overall treatment economically attractive, which is necessary for countries with low GNP if these are expected to adopt wastewater treatment technologies within the next decades. A one-sided focus on wastewater treatment and environmental protection will not be economically feasible for most countries in the world. There exists therefore a real danger, that, in the absence of cost-effective wastewater treatment technology, environmental degradation, including surface and groundwater contamination will continue at ever increasing rates in most of the developing world.

2. LITERATURE SURVEY

S.Vanitha¹, NVN.Nampoothiri², C.Sivapragasam³, Anitha Menon.M⁴ [1] study the AN EXPERIMENTAL STUDY ON

DUCKWEED FOR IMPROVING POND WATER QUALITY and conclusions is given below:-

From the experimental studies conducted, it was understood that the Duckweed plant efficiently removes 75% phosphate from pond water. Comparatively, the Duckweed growth rate enhancement is seen more in the pond water without toxicant Glyphosate. According to Anong Phewnil. There is no current set of standard in toxicity of Atrazine in surface water. In particular, the toxicity to the aquatic plants which are primary producers will cause an imbalance of the aquatic ecosystem. Similarly Glyphosate is being used in large quantities in India causing contamination of surface water. The result obtained in this study may be used to develop Glyphosate application standards for the surface waters of India.

Juliet Selvarani¹, P. Padmavathy², A. Srinivasan, P. Jawahar³ [2] study the PERFORMANCE OF DUCKWEED (LEMNA MINOR) ON DIFFERENT TYPES OF WASTEWATER TREATMENT and conclusion is given below:-

Among the three different wastewaters, Lemna minor achieved the maximum removal efficiency of NH₃, NO₂, NO₃, PO₄, BOD and COD in municipal wastewaters at the rate of 96%, 98%, 98%, 96%, 79% and 79% respectively. The present research work concludes that Lemna minor can perform well in municipal wastewater when compared to sewage and sea food processing plant wastewater treatment systems. Through this investigation, it could be concluded that the nutrient removal load in wastewater can be reduced through duckweed and thus eutrophication could be avoided. There by it is also possible to improve the quality of different wastewaters. The treated wastewater can be used for agriculture and aquaculture activities. The nutrients wasted through wastewaters could be used to produce Lemna biomass and the same could be used as feed for livestock or production of fuel. This wastewater grown duckweed can replace up to 30% of the diet of blue Tilapia (*Oreochromis niloticus*).

Teresa Ozimek¹, Wojciech Dąbrowski², Maria Florkiewicz³ [3] study the DUCKWEED DOES NOT IMPROVE EFFICIENCY OF MUNICIPAL WASTEWATER TREATMENT IN LEMNA SYSTEM PLANTS and conclusion is given below:-

In Lemna minor created the monospecific community. The area covered by plants and their biomass changed during the growing season. The distribution of plant biomass was not uniform across the whole pond area, and varied in different squares of the grid. The SD was high in consecutive months. The comparison of two investigated biomass showed that the biomass of Lemna minor differed significantly only at the beginning of vegetation season. At the beginning of June 2010 the biomass of plants was harvested, and the mean biomass per m² of the overgrown area was decreased two-fold. The biomass was rapidly replenished and by August, the maximum biomass of duckweed was recorded. The second harvest of duckweed took place in August. The reduction of SS, COD and BOD₅ in the samples collected from

consecutive sites was similar in each wastewater treatment plant. The removal efficiency was high in the aerated pond (62–77% for SS, 75–84% for BOD₅ and 54–68% for COD) and very low in the Lemna pond in the systems with and without duckweed. When the SS, COD and BOD₅ were compared within the system, significant differences ($P = 0.05$) were noted only between samples collected at the first site and the other sites in all three wastewater treatment plants. About 50% of measurements of SS and BOD₅, the basic parameters used to establish water quality according to the Water Law Act (2001) in Poland, exceeded the required standards.

Md. Mahmudul Hasan¹, Mehedi Hasan² and Tanveer Saeed³ [4] study the EVALUATION OF DUCKWEED BASED WASTE STABILIZATION POND SYSTEM FOR DOMESTIC WASTEWATER TREATMENT and conclusion is given below:-

Natural systems of wastewater treatment are regarded as sustainable eco-technologies especially for the developing countries. In this study performance of a natural treatment system, namely, duckweed (*S. Polyrhiza*) based waste stabilization pond system for domestic wastewater treatment was investigated. The domestic wastewater was collected from an outlet of a residential building at Dhamondi area in Dhaka city, Bangladesh. The domestic wastewater was poured in a small-scale glass reactor that was subjected to atmospheric conditions with 5 days Hydraulic Retention Time (HRT). Once in a week 20 liters raw domestic wastewater was used as influent; the experiment was carried out for 8 consecutive weeks. Total 16 samples (08 for influent and 08 for effluent) were collected and analyzed to evaluate pollutant removal performances across the experimental system.

3. CONCLUSIONS

In order to find a reliable. Simple and cost-effective small wastewater treatment system, an experimental research programmed on duckweed-based treatment systems was carried out. In spite of the profitable characteristics of duckweed (high productivity, high protein content, wide geographic distribution, control of negative impacts from conventional wastewater treatment ponds), the results obtained confirm that their extensive use in Italy seems difficult because of the high requirement of land area and the ceasing of growth in winter months (at least in Northern Italy). In temperate climates, a reasonable use of duckweed looks to be the production of good quality secondary effluents (BOD and SS removal) from small communities, especially in seasonal (summer) wastewater treatment plants. Another use is algae removal from facultative lagoon effluents.

Nitrogen removal can only be reasonably obtained in duckweed-covered ponds with supplemental aeration. Because of several constraints due to the markets and to environmental regulations, harvested duckweed has to be

disposed of as sewage sludge (e.g. compost or biogas production).

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