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Short Communication

Synergistic Effect of Biomass Production as Protein Feed Stock, Biofuel Against with Nitrate Bioremoval in Lab Scale Wastewater Treatment System Using *Lemna Minor*

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Eutrophication is one of the major problems that we are facing today and it would affect negatively aquatic life's. Nitrate pollutant leads to increase in the growth of algal bloom those results in eutrophication of fresh water with increase of high concentration of nitrate and phosphorus in water, the dissolved oxygen tends to decreased. Plant based biotreatment (Phytotechnology) process was used to eliminate nitrate contaminant from aquatic system. So as to avoid the eutrophic formation of fresh water and to determine the efficiency of nitrate utilization by specific aquatic plants (Duckweed: *Lemna minor*) from eutrophic lakes.

Skillicorn., *et al*. (1993), reported that the duckweeds have the potential to purify wastewater in association with bacteria of both aerobic and anaerobic forms. The previous literature stated that the duckweed mat was fully covered on the surface of the water, as observed in three zones. They are the following zones, including (i) aerobic zone, which is 10 cm below the duckweed mat, anoxic zone and anaerobic zone [1]. Atlay., *et al*. (1996), described the duckweed was well known for its high productivity and high protein rich content in temperate climates. They are green and have a small size (1 - 3mm) and also have short but dense roots (1-3cm) [2]. Cheng., *et al*. (2002), pointed about the duckweed, which was a small, free floating aquatic plant belonging to Lemnaceae family [3]. Hasar., *et al*. (2000), noted duckweed fronds grow in colonies at particular growth conditions which forms a dense and uniform surface mat [4]. Tchobanoglous and Burton [5] concluded that in the aerobic zone, organic materials are oxidised by aerobic bacteria using atmospheric oxygen transferred by duckweed roots. Gearheart [6] stated that wetland treatment process was a combination of all the unit operations in a conventional treatment process in addition to other physico-chemical processes, sedimentation, biological oxidation, nutrient incorporation, adsorption and precipitation. Smith and Moelyowati [7] observed the nitrification and denitrification takes place in anoxic zones, where organic nitrogen was decomposed by anoxic bacteria into ammonium and ortho-phosphate, which are intermediate products used as nutrients by the duckweed. Redding., *et al*. [8] mentioned that ecological engineering, including the employment of constructed wetlands and the culture of aquatic macrophytes, for the purpose of pollution abatement has received growing acceptance. Zhou., *et al*. [9] stated that the duckweeds were used in environmental remediation and potential as an efficient feedstock for fuel and bioproducts.

In this study, the young plants with average wet biomass of 0.5g were used as bioinoculum in 100 ml of nitrate solution (100 ppm concentration) at room temperature under optimum light intensity and were allowed to grow for about one month as biotreatment period. The biomass (gm) by gravimetric method and the nitrate reduction (%) using spectrophotometer were measured on alternative days of the experiment. In brief, the amounts of *Lemna minor* are increased considerably in wastewater containing high concentration of nitrate which showed the ability of duckweeds to assimilate nutrients from wastewater. In the other hand, the amount of nitrate decline (75%) significantly as same time as the duckweed biomass increased (5g in dry weight biomass). The *Lemna minor* was found to be potential and effective for nitrate removal from wastewater. Simultaneously, the use of duckweed based wastewater treatment systems beneficial for producing biomass as protein feed stock for animals. Duckweed biomass production also has potential environmental and socioeconomic benefits, that will sustain the growth of the biofuel technology and industry.

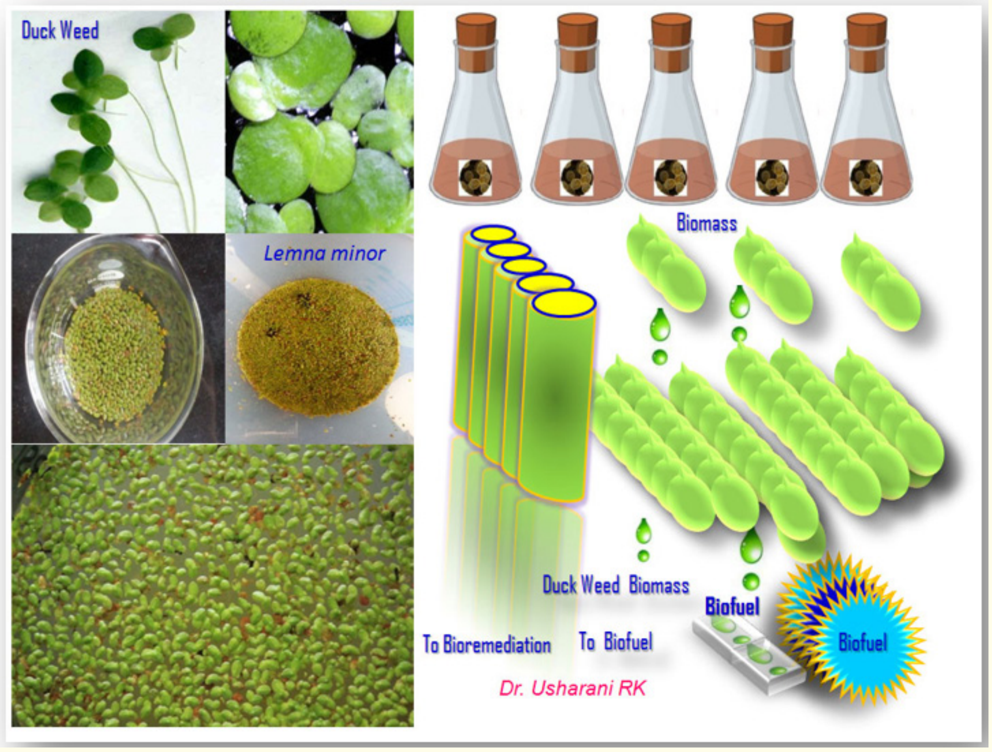

Figure 1

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