BIOLOGICAL TREATMENT OF AGRICULTURAL DRAINS WATER

Submitted By

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A thesis submitted in Partial Fulfillment
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APPROVAL SHEET

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ABSTRACT

Marwa Mohammad Reda Mahmoud Afifi: Biological Treatment of Agricultural Drains Water. Unpublished *Ph.D* Thesis, Agriculture Science Department, Institute of Environmental Studies and Research, Ain Shams University, 2017.

Against the backdrop of scarce water resources coupled with the increasing demand on water for agricultural expansion, the reuse of drainage water has become an important element of Egypt's national water policy. Discharging untreated sewage and chemical wastes directly into drains has become an alarming problem and with the growing population, water bodies would no longer cope with the increasing pollution loads. Therefore, biological treatment of drainage water became one of the most promising solutions to solve the water scarcity problem.

Aiming at the biological treatments of drains water to be useful in agriculture processes as well as producing the green algal biomass, the present work was achieved. Water samples were collected from EL-Salam canal from different sites including Bahr El-Bakar and Bahr Hadous to draw the contamination line through chemical and biological analyses .

Highest results of chemical composition and microbial load in Bahr El-Bakar drain was found in Om EL-Resh site compare to other nutrients in other sites that mostly lies within the permissible limits making water in suitable for irrigation purposes. From the presented results Om- EL Resh location seems to be the most salt contaminate water and more suitable for many algal species growth that able to drastically removing such nutrients .

Treatment drains water by algae has two stages: the first stage; growth curve of algal species including *Chlorella vulgaris* and *Spirulina platensis* was determined under recommended growth media of tape water. Several nutritional modifications were performed to enhance elements absorption and removal by algae through enhancing algal growth. Experiments were including the nitrogen sources (urea & nitrate) and potassium starvation for both algae species parallel to determination of nutrients removal. It could be concluded that urea stimulates algal growth as well as nutrients removal by both examined algae with some

surpasses response in *Chlorella* rather than *Spirulina*. The second stage; drains water were used to grow the proper alga (*Chlorella vulgaris*). Growth was performed using original wastewater and as it was enriched by nitrogen or phosphorous and both of them by the same amount of BG-11 growth medium.

Urea as well as phosphorous enrichment increased algal growth using Om El-Resh wastewater, but mixed enriching with urea and phosphorous added an extra enhancing effect. Microbial load was completely disappeared after 48 hours of algal incubation with different wastewater .

Om El-Resh treated water by algae represented the most polluted load which in turn gave the highest algal growth rate and selected to use it in castor bean irrigation . Besid use of Om El-Resh treated water by alga in castor irrigation; other water sources were used including Om El-Resh original wastewater, Om El-Resh wastewater containing the grown alga, ground water and fresh water.

In filed, Germination rat of castor seeds was found to be as low as. Thus, seedling was performed in artificial soil. No fertilizer compounds were added to the grown castor plants. Yield and yield components of castor bean were determined .

Growth and yield were run in the following order of Om El-Resh wastewater containing the grown alga, Om El-Resh treated water, Om El-Resh original wastewater, ground water and then fresh water. Seeds and other yield components gave the same order. Oil content was drastically affected by water type use and recorded as 9.09, 34.9, 29.65, 31.89 and 42.71 % with fresh water, ground water, original wastewater, treated wastewater and wastewater containing the grown alga, respectively.

The most potent fatty acid present in castor oil is the hydroxy fatty acid; concerning fatty acid composition of castor seed oil, ricinoleic acid represented over 87% of the total fatty acid composition. Other fatty acids present were linoleic (5.28-12.03%), oleic (0.0–4.33%), palmitic (1.36–3.86%), stearic (1.18-1.73%) and γ-Linoleic (0.0-2.2%).The unsaturated fatty acids content was 97.5% of the total fatty acids composition in oil produced from plants irrigated with wastewater containing the alga biomass.

Key Words: Wastewater Treatment; Algae; Irrigation; Castor oil.

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