POTENTIALITY OF *AZOLLA* IN PHYTOREMEDIATION OF SOME HEAVY METALS FROM AGRICULTURALWASTEWATER

By

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ABSTRACT

Rabab Rahmy Hanafy Sayed. Role of *Azolla* in Accumulation of Some Heavy Metals from Agricultural wastewater. Unpublished M.Sc. Thesis, Faculty of Agriculture Ain Shams University, 2017.

Azolla pinnata is a small aquatic fern which considered as a multipurpose organism. It is used in bioremediation to remove heavy metals from polluted wastewaters. In view of its potentiality, *Azolla pinnata* were tested for their growth on different media (Yoshida, Peat moss, and Soil media) to select the best media for the growth of *Azolla pinnata*. Then the best media was examined for the potentiality of *Azolla pinnata* to withstand a different concentrations of different heavy metals. Yoshida medium was found to be the most suitable medium, as it recorded the highest significant records in fresh and dry weight, being 25.38 and 1.69 g/ pot respectively, the doubling time was 5.36 days, NPK%, being 3.87, 0.58 and 1.59% respectively and nitrogenase activity reached to 13.29 μmol C_2H_4/ g dry weight. / hr.

The fresh and dry weight of *Azolla pinnata* exposed to Pb^{+2}**,** Co^{+2}, Cu^{+2}, were increased by increasing the concentration of the metals from 5 to 35 mg/liter then it decreased at concentration 45 mg/liter for all the tested heavy metals. While, doubling time decreased gradually by increasing the concentration of Pb^{+2} , Co^{+2} **,** Cu^{+2} from 5 to 35 mg/liter and started to increase by increasing the concentration of Pb^{+2} to 45 mg/liter in the medium.

When *Azolla pinnata* was cultivated for 25 days in different concentrations from agricultural wastewaters (25%, 50%, 75% and 100%) contaminated with Pb^{++}, Co, and Cu, the highest values of fresh and dry weight of *Azolla pinnata* as well as NPK% were recorded within the treatment of 75% agricultural wastewater and 25% tap water being 11.19 and 0.73 (g/pot); 3.35%, 0.80% and 2.75% in drain 1 ; 10.89 and 0.73 (g/pot) 1; 3.39%, 0.69% and 2.69% in drain 2 and 11.2 and 0.73 (g/pot), 3.31%, 1.69% and 2.71% in drain 3 respectively.

The lowest doubling time was recorded within *Azolla pinnata* inoculated on 75% agricultural wastewater during all incubation period in the three agricultural wastewaters being 2.17, 3.56, 4.96, 5.96 and 7.17 days in drain 1 2.22, 3.56, 4.71, 6.01 and 7.25 days in drain 2 and 2.58, 4.21, 4.90, 6.00 and 7.25 days in drain 3 respectively. While the lowest heavy metal concentrations were recorded in *Azolla pinnata* cultivated in 25% agricultural wastewater during all incubation periods in the three tested agricultural wastewaters.

Rice plants irrigated with remediated agricultural wastewaters recorded that highest significant increase in plant height (cm), grain yield (g/pot) and straw yield (g/pot) were recorded within plants irrigated by 75% agricultural wastewater and inoculated with *Azolla pinnata* + *Pseudomonas fluorescens* being 97.85 (cm), 29.40 (g/pot) and 26.90 (g/pot); 1.62, 2.29 and 1.10% in grain and 0.73, 0.52 and 1.97% in straw respectively. While the lowest significant concentration in (Pb, Co and Cu) were recorded in plants irrigated with 25% agricultural wastewater and inoculated with *Azolla pinnata* and *Pseudomonas fluorescens* being 0.01, 0.01, 0.02 mg/g dry weight in grain and 0.02, 0.01 and 0.03 mg/g dry weight in straw respectively.

In wheat plants irrigated with remediated agricultural wastewaters recorded that highest significant increase in plant height (cm), grain yield (g/pot) and straw yield (g/pot) were recorded within plants irrigated by 75% agricultural wastewater and inoculated with *Azolla pinnata* + *Pseudomonas fluorescens* being 93.30 (cm), 31.96 (g/pot) and 26.67 (g/pot) and1.95, 0.91 and 2.10% in grain and 0.85, 0.55 and 1.93% in straw respectively. While the lowest significant concentration from (Pb, Co and Cu) were recorded in plants irrigated with 25% agricultural wastewater and inoculated with *Azolla pinnata* and *Pseudomonas fluorescens* being 0.11, 0.09, 0.22 mg/g dry weight grain and 0.13, 0.12, 0.29 mg/g dry weight in straw respectively.

Key Words: *Azolla pinnata*, Agricultural Wastewater, Heavy Metals, Phytoremediation

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CONTENTS

LIST OF TABLES

LIST OF FIGURES