SUMMARY

The respeat investigation was carried out in an attempt to add some information about the growth of Azolla pinnata under variable concantrations of Ca levels applied either with pre-subjection to EDTA (chelating agent) or with the application of heavy metals,i.e. Cd,Pb or Hg .

To approach this aim, two detailed experiments were carried out under semi-controlled conditions which include ;-

1- Effect of variable calcium levels on the growth of Azolla pinnata plants which pre-subjected to EDTA for two or four hours.

2- Azolla plant growth behaviour as affected by Cadmium (Cd),Lead (Pb) and Murcury (Hg) with the presence of variable calcium levels in the growing media.

It could be summarized the obtained results as follows :-

A) Experiment I :

a) Growth behaviour :

1) Pre-subjection of Azolla plants to the 0.01 % aquious solution of EDTA decreased significantly the biomass fresh and dry weights production.

Such decrement was increased with increasing the time of exposure from two to four hours. Thus, it concluded that EDTA hase anpartial effect on fresh and dry weights.

2) The level of Ca in the growing media modified the adverse effect of EDTA on fresh and dry weights production of the biomass.

3) It could be concluded that EDTA seemed to control the physiological activity of Azolla biomass, and the presence of Ca levels modified such adverse effect .

4) EDTA stimulated the higher fragmentation of Azolla plants, and the presence of Ca levels affected significantly such stimulation effects and that lead to the assumption that the presence of Ca reverse the effect of EDTA on the fragmentation processes.

5) Both EDTA and Ca levels affected the size of frond through the changes in its fresh and dry weights. The time of exposure to EDTA affected frond size.

6) Both EDTA and Ca levels affected significantly the formation of roots and the root length.The absence of Ca increased such absorption portion of Azolla plants.

7) Calcium play an important role on Azolla plant growth and its effects were differed according to its presence level in the growing media, and that was discussed on the bases that Ca affected the structure and function of cell membranes, but EDTA had a removal effects on the presence of Ca from such membranes.

b) Chemical composition :

1) Both Ca and EDTA affected the sugars contents in Azolla plants as concentration (mg./gr.dry weight) or total contents in the biomass per vessel or per one frond. Accordingly, it was concluded that such chelating agent and the presence of Ca levels seemed to have a regulatory effects on sugars synthesis, assimilation or utilization which take a part in plant growth behaviour.

2) Both EDTA and different Ca levels affected nitrogen fixation by Azolla-Anabaena symbiosis. The presence of Ca reduced such activity, and the most suitable concentration of Ca in the growing medium was the normal 2/5 of Hoagland nutritive solution in this respect. Higher of lower Levels of Ca over or under such Ca level minimized the nitrogen fixation activity.

3) Calcium seemed to have a role on the absorption of P,K,Ca and Mg by Azolla plants, and such role modified by the pre-subjection to EDTA. This conclusion was discussed on the bases that Ca affected the absorption of such nutrients. Also the presence of one ion in the growing media affected the absorption of another one through the antagonistic effects.

B) Experiment II :

a) Growth behaviour :

1) The presence of Cd,Pb or Hg had an adverse toxic effets on Azolla growth,as fresh or dry weights of biomass per vessel or per one frond. Such adverse effect was greatest under Cd or Hg than Pb.

2) The presence of Ca in the growing media in different rates modified the toxic effects of heavy metals on the growth behaviour of Azolla, and the best level of Ca in this respect was the normal of 2/5 Hoagland solution.

b) Chemical composition :

1) It could be revealed from the obtained results that the toxic effect of heavy metals on plant

growth was occurred as a result of their adverse effects on the accumulation,utilization and assimilation of sugars in plant tissues, while the presence of Ca at different rates in the growing media modified the toxic effects of heavy metals on sugars metabolism.

2) It could be concluded from the different obtained results that heavy metals depressed the nitrogen fixation which lead to a lower accumulation of nitrogenous compounds in plant tissues, and Ca regulated and modified such adverse effects of heavy metals.

3) Both heavy metals and Ca affected the absorption rates of P,K,Ca and Mg and that affected the plant growth behaviour.

4) It was suggested that Azolla may be used as an indicator or monitors for the pollution with heavy metals, as its growth behaviour reduced greatly under the presence pf heavy metals and finally the mortality of the fronds was observed.

5) It was suggested also that the toxic mechanism of action of the studied heavy metals (Cd,Pb or Hg) was greatly differed between the tested

heavy metals, as the differences in the obtained data were greatly variable under the different treatments.