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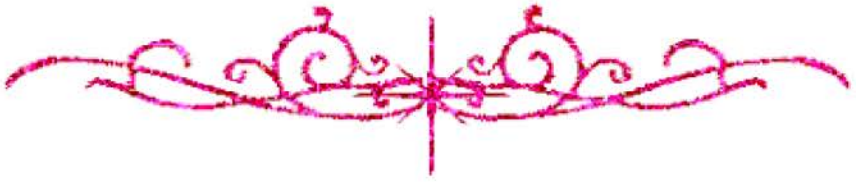

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EFFECT OF SOME HEAVY METALS ON GROWTH AND CHEMICAL COMPOSITION OF SOME ORNAMENTAL PLANTS

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Title of thesis EFFECT OF SOME HEAVY METALS ON GROWTH AND CHEMICAL COMPOSITION OF SOME ORNAMENTAL PLANTS

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ABSTRACT

Three sets of experimental trials were conducted throughout two successive years(2000/ 2001and2001/2002)at the nursery of Ornamental Horticulture Department, Faculty of Agriculture, Cairo University.They were intended to find out the response of three economic ornamental plants (***Pelargonium zonale***, Willd ; ***Gazania splenden***, Hort and ***Vinca rosea***, L.) to three heavy metals (Cd,Pb and Ni) and their combination on growth and chemical constituents of the aforementioned plants. Thus, rooted cuttings of about 15 cm. length of ***Pelargonium zonale***, Willd and seedlings of the same length of ***Gazania splendens***, Hort and ***Vinca rosea***L. were used. They were planted on August 1st 2000.The plants left to grow at the open field condition till July 31th 2002.Throughout the two experimental trials the plants were sprayed with water polluted with determined concentrations of the different heavy metals(Cd,Pb and Ni)at 15 days intervals commencing from Oct. 1st 2000 i.e. after two months from planting(Cd at 1,2, 4 and 6 ppm. : Pb at 10,25,50 and 75 ppm. and Ni at 2, 4, 8 and 12 ppm.) as well as with spraying every plant species with Pb at 50 ppm., Cd at 4 ppm. and Ni at 8 ppm. as individual doses for studying the combined effect of the three heavy metals. in the same date of spraying. Every plant species sprayed 22 times in every experimental year.The results emphasized the followings : ***Pelargonium zonale***, Willd : Using Cd treatments revealed a decrement on most morphological plant traits.Chlorophyll(a).chlorophyll(b) and carotenoids were increased due to using Cd treatments. Indole and phenols content also increased by applying the different concentrations of Cd with obvious increment for using the highest concentration(6 ppm.)for indole and with applying the lowest ones (1and 2 ppm.)for phenols.All Cd treatments increased its accumulation content in inflorescence,leaves, stems and roots with maximum increment with using the highest concentration(6 ppm.).A decrement on plant traits was observed due to applying the different concentrations of Pb. Chlorophyll(a),chlorophyll(b)and carotenoids were also increased due to the different Pb treatments. Moreover, indole and phenols content increased by applying Pb with clear effect with using Pb at 10 ppm. for indole and 25 ppm. for phenols, respectively. Pb accumulations in inflorescence, leaves, stems and roots were increased by treating the plants with the different concentrations of Pb with maximum increment by using the highest concentration(75 ppm.). Applying the different Ni treatments revealed a decrement on most plant parameters.Meanwhile,Chlorophyll(a).chlorophyll(b)and carotenoids also increased by Ni treatments. Indole and phenols content revealed also an increment due to Ni treatments.The highest content of indole resulted from Ni treatments at 8 and 12 ppm., whereas, the highest phenols content resulted from the lowest concentration(2 ppm.).Ni accumulation in inflorescence, leaves stems and roots were increased by treating the plants with the different Ni treatments.A decrement on most plant traits was detected due to applying the mixture of Cd,Pband Ni.Meanwhile,Chlorophyll(a).chlorophyll(b)and carotenoids also increased due to applying the previous treatment.While indole content in leaves was increased due to using the mixture treatment, Also,the same treatment increased the accumulation content of Cd,Pb and Ni in inflorescence, leaves, stems and roots. ***Gazania splendens***,**Hort :** Using Cd treatments revealed a decrement on most morphological plant traits studied.Chlorophyll(a),chlorophyll(b)and carotenoids also decreased by receiving the plants the different concentrations of Cd.Morever,they caused an increment on the accumulation content of Cd in inflorescence, stems and leaves, with clear effect by using the highest concentration(6 ppm.).However, this treatments revealed only a slight increment the accumulation content in roots.Pb treatments in most cases had a decrement on most morphological plant parameters.Morever, chlorophyll(a).chlorophyll(b)and carotenoids also decreased by Pb treatments with a clear effect by using Pb at 25 ppm. for chlorophyll(a) and chlorophyll(b)and 75 ppm.Pb for carotenoids.While,indole content was decreased by Pb application,phenols content revealed an increment in this concern.A gradual increment on Pb accumulation in inflorescence, leaves and roots was observed due to increasing the concentration of Pb treatments.Also, it revealed an increment in stems by using the different concentrations.A gradual decrement was noticed on leaf area, root length and fresh and dry weights of roots,by increasing the concentration of Ni application.However,the other plant traits revealed also a decrement resulting from applying the different Ni treatments.Morever,chlorophyll(a),chlorophyll(b) and carotenoids were decreased due to the different Ni treatments. The same treatments revealed a decrement on indole content in leaves and increment on phenols.Ni accumulation in inflorescence,leaves,stems and roots was increased resulting from applying the different Ni concentrations.Using the mixture of Cd,Pb and Ni showed a decrement on all morphological traits.Chlorophyll(a),chlorophyll(b)and carotenoids revealed an increment due to receiving the plants the previous

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treatment.Meanwhile, indole content was decreased by its application and the contrary action was detected in case of phenols content.Morever, applying the mixture of Cd,Pb and Ni caused an increment on the accumulation content of Cd,Pb and Ni in inflorescence, leaves, stems and roots. ***Vinca rosea*, L.** Generally,the results showed a decrement on most morphological plant traits due to receiving the plants the different concentrations of Cd. Chlorophyll(a),chlorophyll(b)and carotenoids were also decreased resulting from all Cd applications.Whereas,indole and phenols content in leaves were increased by receiving the plants the different concentrations of Cd.Treating the plants with all Cd concentrations increased Cd accumulation in flowers.Whereas,they showed a slight increment in accumulation content in leaves and roots due to using Cd at1,2 and4 ppm.,with clear increment with using the highest concentration(6ppm.).Meanwhile,a gradual increment of Cd accumulation in stems was noticed in stems by increasing the concentration of Cd application. The decrement on most plant parameter was detected resulting from applying the different Pb concentrations.Chlorophyll(a),chlorophyll (b)and carotenoids in leaves were decreased as a result of all Pb treatments.Also,indole and phenols content increased due to the same treatments.Treating the plants with the different Pb concentrations increased Pb accumulation in flowers,stems and roots,with a gradual increment by increasing the concentration of Pb application.Also,it increased by the same treatments in leaves with obvious increment by using the highest concentration(75 ppm.).Ni treatments revealed a slight effect on plant morphological traits when compared with the effect of the above mentioned heavy metals(CdandPb).However,it could be concluded that,the highest concentrations of Ni(8and12ppm.)were the most effective treatments in reducing plant traits.Chlorophyll(a),chlorophyll(b)and carotenoids were decreased resulting from receiving the plants the different concentrations of Ni treatments.Indole and phenols content in leaves were increased by applying the different concentrations of Ni. The highest contents from both resulted from receiving the plants the highest concentration(12ppm.).All Ni treatments increased its accumulation in flowers,stems,leaves and roots.Using the highest concentration (12 ppm.)revealed the highest accumulation content in the different plant organs.All plants traits revealed a decrement as a result of receiving the plants the mixture of Cd,Pband Ni,with the exception for its effect on plant height which showed negligible and insignificant effect in this concern.Chlorophyll(a),chlorophyll(b)andcarotenoids were decreased due to applying the above mentioned treatment.Whereas,it increased indole and phenols content in leaves.Also,receiving the plants such treatment increased the accumulation content of Cd,Pb and Ni in the different plant organs(flowers,leaves,stems and roots)with the exception of its effect on Cd accumulation in roots in which revealed negligible effect.

A-A-El-Sayed

TO MY
FATHER AND MOTHER
IN MUCH GRATITUDE