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Evaluation of the plant phytoremediation efficiency of *Gazania rigens* by some biochemical factors

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ABSTRACT

This study was investigated to evaluate the effect of humic acid on cadmium uptake in Gazania rigens at the Islamic Azad University, Science and Research Branch. The experiment was carried out in a completely randomized design (CRD) with 2 factors humic acid at 2 levels (100,200) and cadmium at 2 levels (3 and 5 mg/L) in three replications. Several traits such as Uptake of Pb and Cd roots and stems, proline, anthocyanins, chlorophyll was measured. The results showed that 200 mg/L Humic acid had a significant difference compared to the control. Increasing humic acid improves biochemical parameters such as proline, chlorophyll.

Key words: Cd, humic acid, phytoremediation, *Gazania*

INTRODUCTION

The indiscriminate use of chemicals at production process increase substances over maximum permissible concentrations in soil, air, water and meal. Therefore, intensive agricultural and industrial activities in many areas, destroyed water quality and soil [1]. Humic material raise nutrient uptake through the activation of microbes. The humic acid band heavy metal from carboxyl groups which can reduce the risk of toxic metals such as Cd in plant [2]. By increasing the importance of urban pollution, clean up with plants has been increasingly recognizing. Since ornamental plants are abundant sources available in urban areas so more likely to have attention than others. Production of ornamental plants to eliminate high levels of pollution are affordable and can be used to absorb water and soil pollution [3]. Gazania is a popular horticultural subject worldwide and comprises 16 species, all from southern Africa. It is a member of the tribe Arctoteae, subtribe Gorteriinae, which includes seven other genera [4]. This study was investigated to evaluate the effect of humic acid on cadmium uptake in *Gazania rigens.*

MATERIALS AND METHODS

In this test, we used pots with the diameter of 20 cm, and the height of 35 cm. Gazania seeds were germinated, transplanted into media and grown-on for 150 days. Then the plant were kept in 23±2 centigrade degrees and relative humidity of 70 % ± 5%. 195 seedlings were prepared and after emersion 5 leaf stage, treatment of Cd (C) in the form of Cadmium chloride were applied at three levels: C1 = 0, C2 = 3, C3 = 5 mg/ L and humic acid (H) at three levels H1 = 0, H2 = 100, H3 = 200 mg/L. At the end of the experiment plants and transfered in plastic bags in order to test the analytical extracted in the laboratory. 20 leaves of each repetition were wrapped in aluminum foil and plastic were transferred to the freezer -80 ° C. Proline was measured by Bates et al method [5]. To determine the amount of chlorophyll in leaves of Front and et al method [6]. was used. The method for measuring the amount

of anthocyanins was Sankhla et al [7]. Cd concentrations in roots and stems was evaluated by standard methods AOAC 999.11.

Analysis was performed on data using SPSS 16. Comparisons were made using one -way analysis of variance [ANOVA] and Duncan's multiple range tests. Differences were considered to be significant at P ≤0.05.

RESULT AND DISCUSSION

According to Chart 1, could be conclude there is no significant differences between the control and the interactions between Cd and humic acid at proline rate. Results is according to Datal (2000). According to Chart 2, we observe that byusing humic acid, their interaction was significant compared to control and anthocyanin enhanced. Considering to Figure 3, using humic acid has improved chlorophyll content of plants. The highest chlorophyll a content was achieved in C1H2 treatment. In chart 4, with increasing concentrations of Cd accumulation in the stem will increased. There was significant difference between the control.

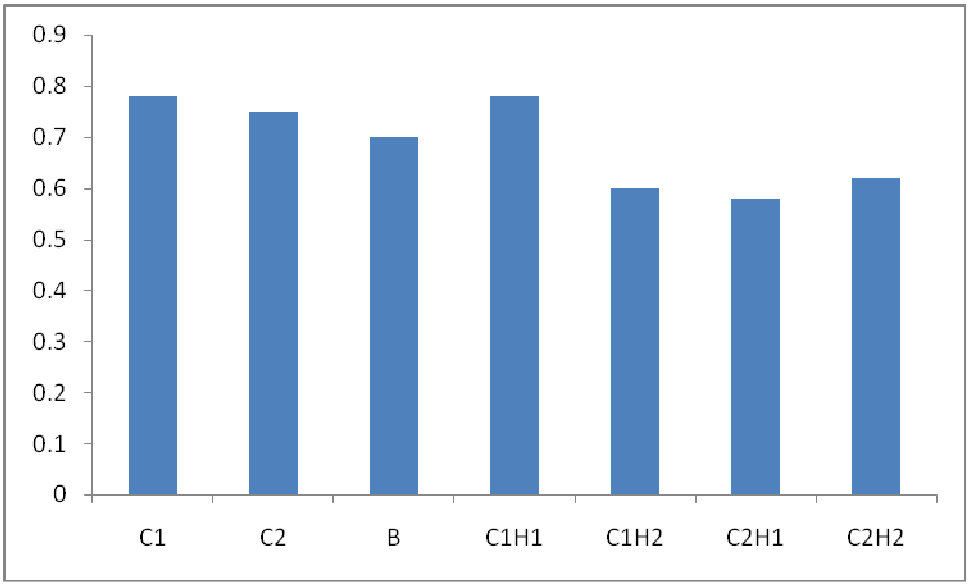

Chart 1. The effect of treatments on proline contents

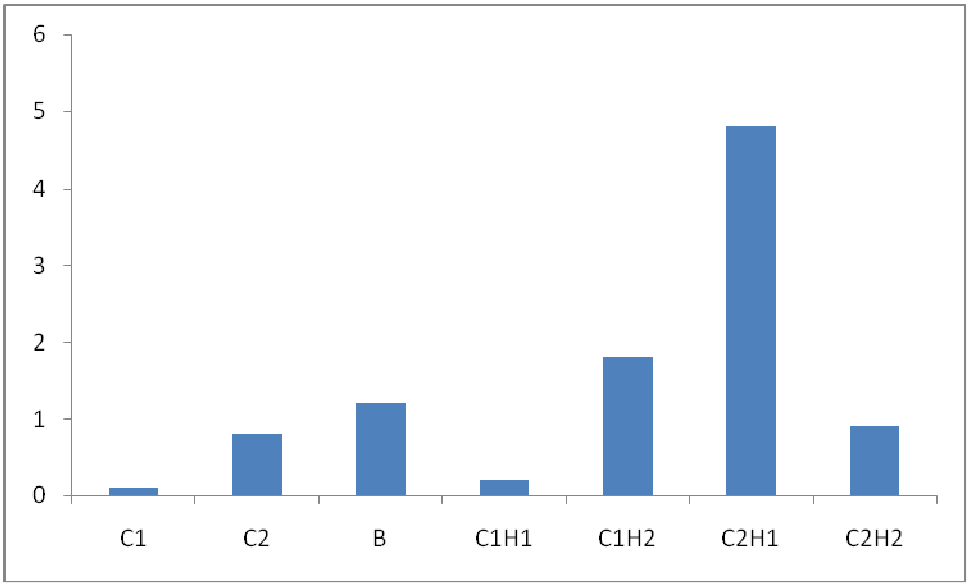

Chart 2. The effect of treatments on anthocyanin contents

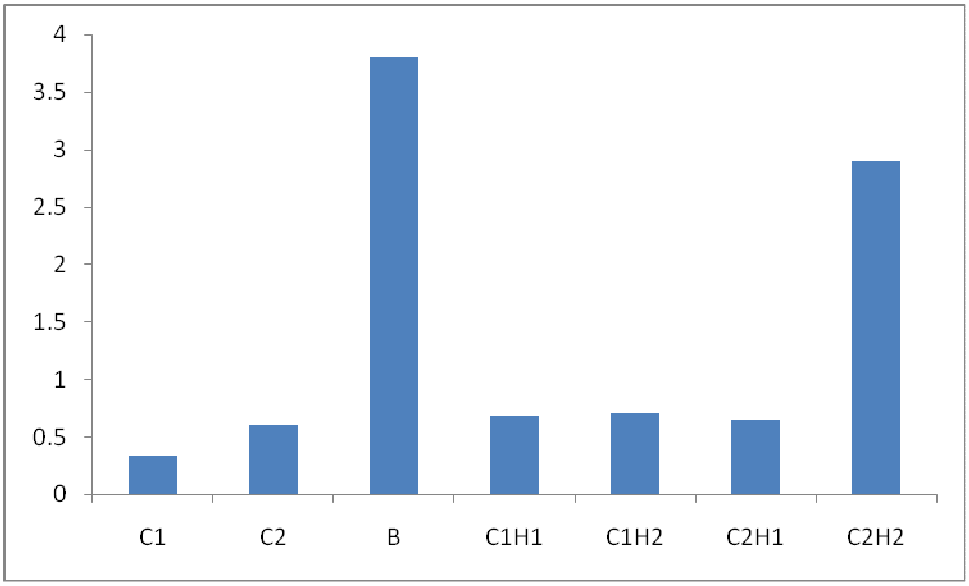

Chart 3. The effect of treatments on cholophyl a contents

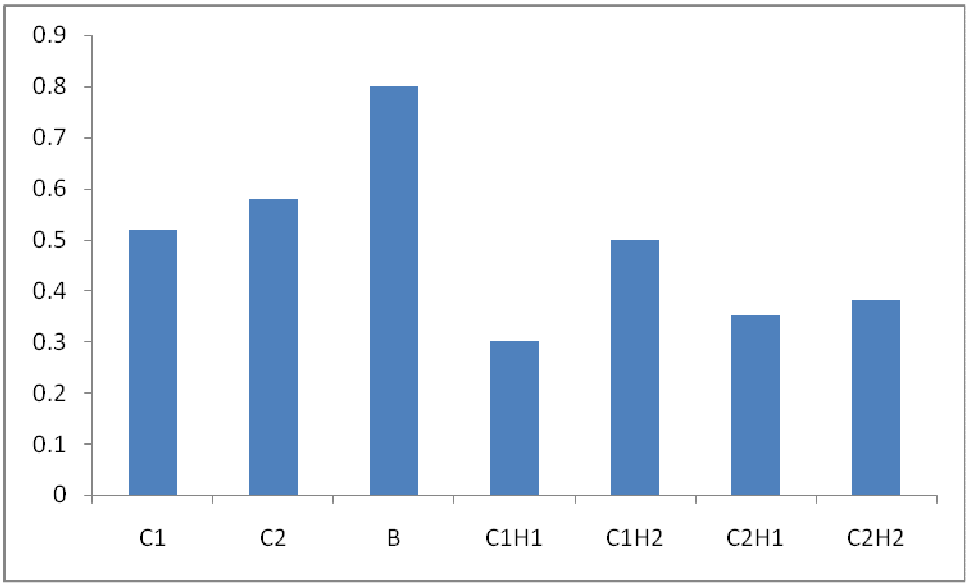

Chart 4. The effect of treatments on cholophyl b contents

Humic acid up to 200 ml / L will rise Cd accumulationat stem and there were no significant differences from controls. Zhonget al (2011) also investigated the availability of heavy metals in *Osmantus* ornamental plan. They indicated Cd concentrations in plant tissues, especially in leaves and stems enhanced by increasing concentrations of Cd [8]. Chart 5 and 6 which are found due to by use of humic acid on two levels 100, 200 mg/L Cd accumulation level grow in the roots and the plant. These results were similar to Li and Chen (2006) whose reported same conclusion [9].

In general, it could be that the humic acid can have a direct positive effect on plant growth. It was found that anthocyanin by using humic acid anthocyanin had no significant difference compared to control.

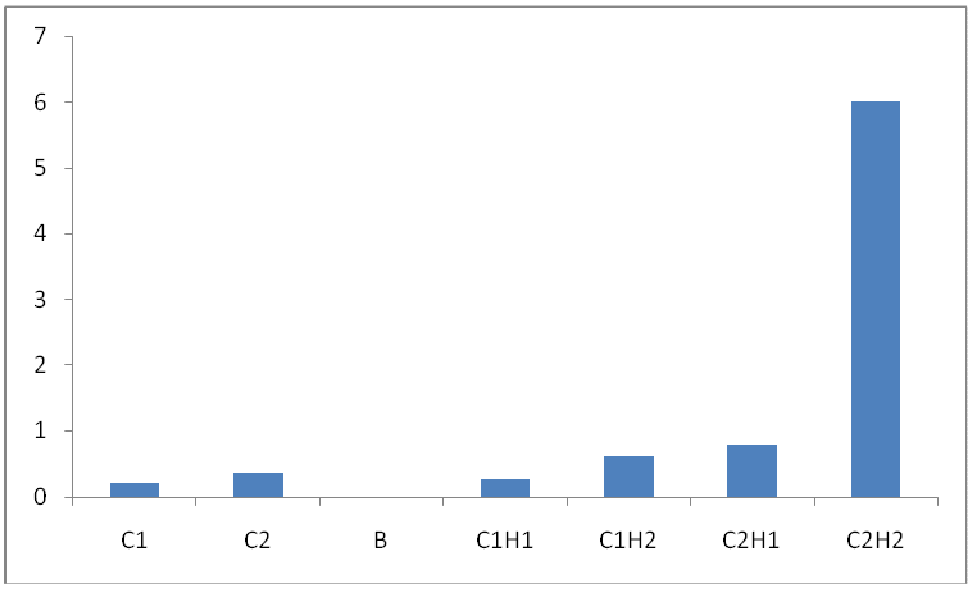

Chart 5. The effect of treatments on Cd stem contents

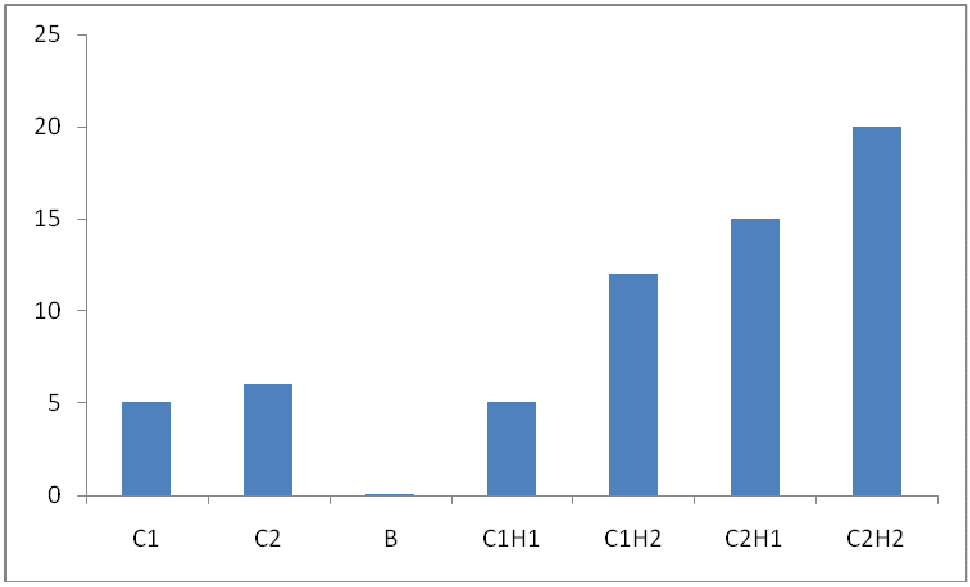

Chart 6. The effect of treatments on total Cd contents

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