

**-64- Summary of**

**STUDY THE EFFECT OF LEAD AND SOME LEAD REMEDIATION  
TREATMENTS ON GROWTH, YIELD AND CHEMICAL COMPOSITION OF  
COMMON BEAN**

**A thesis**

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**Of**

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**By**

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## **SUMMARY**

**The current study was conducted to investigate the effects of soil pollution with four different levels of lead (0, 100, 200, and 300 ppm) and five different remediation treatments (control, Bacillus subtilis, cattle manure, super phosphate and a mixture of the previous types of the remediation treatments.) as well as their interactions on the vegetative growth characters, green pods yield and its components, dry seed yield and some chemical contents of the roots, stems, leaves, green pods and dry seeds of common bean (*Phaseolus vulgaris* L.) cv. "Giza".**

**Two pot experiments were carried out during the summer seasons of 2005 and 2006 at the Experimental Farm, El-Bostan, Faculty of agriculture, Damanhour Branch, Alexandria University. A split plot experiment in a complete randomized block design was used with three replications.**

**The obtained results of the present investigation could be summarized as follow**

### **Seed germination and root growth**

**Seed germination was inhibited significantly at 200 and 300 ppm Pb treatments compared to control but there was no significant inhibition**

at lower concentration than the control in both seasons after 72 and  
.120 hours

Lead treatment significantly decreased the primary root length and -<sup>2</sup>  
average number of lateral roots at all concentrations compared to the  
.control at 72 and 120 hours in both seasons

#### Vegetative growth characters

Lead treatments (100, 200, and 300 ppm) significantly, decreased -<sup>1</sup>  
plant height, number of branches, plant fresh weight and dry weight,  
compared with the untreated soils (0 ppm) , in both seasons. The  
highest lead application level (300 ppm) was the most inhibitory one on  
.all the studied vegetative growth characters

The remediation treatments of *Bacillus subtilis* , cattle manure , -<sup>2</sup>  
calcium super phosphate and the mixed treatment), significantly  
increased plant height, average number of branches plant-1, plant  
fresh and dry weight over the control treatment, in both seasons. The  
mixed treatment was remarkable and associated with the highest mean  
.values in this concern

The interaction effects of lead levels and remediation treatments on -<sup>3</sup>  
all the studied vegetative growth characters, were significant with the  
exception of plant fresh and dry weight in both seasons . Pb at 300ppm,

**both super phosphate and mixed treatments gave the highest mean values of the studied vegetative growth characters**

### **Green Pods Yield and its components**

**Lead treatments reflected significant effects on average number and yield of green pods plant-1 .Comparison among the means showed that increased lead application rates decreased significantly number and yield of green pods plant-1**

**The application of remediation treatments (Bacillus subtilis, cattle manure, super phosphate calcium and the mixed treatment), to the soil, significantly increased number of green pods plant-1, weight of green pods plant-1 compared with the control treatment, in both seasons. The higher mean values of number and yield of green pods were achieved with mixed, super phosphate treatments in both seasons**

**The interaction effects of lead levels and remediation treatments reflected some significant effects. The combined treatments of the control and mixed, super phosphate and bacillus treatments gave higher mean values of number and yield of green pods plant-1 , in both seasons**

### **Dry Seeds Yield and its Components**

**Lead application at the rates of 100, 200 and 300 ppm significantly, -<sup>1</sup> decreased weight of dry seeds plant-1, and number and yield of dry pods plant-1 as well as yield of dry seeds plant-1 compared to control treatment, in both seasons**

**Remediation treatments of Bacillus subtilis, cattle manure, calcium -<sup>2</sup> super phosphate and the mixed, significantly increased mean values of number and yield of dry pods plant-1 as well as yield of dry seeds plant-1 compared to the control, in the two growing seasons. The mixed and super phosphate treatments were more effective than bacteria and cattle manure treatments in lead remediation**

**The interaction effects of lead levels and remediation treatments -<sup>3</sup> reflected some significant effects. The highest mean values of number and yield of dry pods plant-1 as well as dry seeds yield plant-1 could be obtained by application of super phosphate or mixed or bacteria treatments accompanied by lower Pb levels, and higher pb level together with either super phosphate or mixed treatments**

#### **:Chemical Contents of plant parts**

**Application of the three different levels of lead (100, 200, and 300 -<sup>1</sup> ppm) significantly, decreased N P K contents of root, stems and leaves, leaf chlorophyll A, B and carotenoids contents and protein contents of green pods and dry seeds relative to control treatment, in both**

seasons. However, Pb content in roots ,stems ,leaves, green pods and .dry Seeds was increased with increasing soil Pb level in both seasons

Remediation treatments (cattle manure), to the soil , significantly, -<sup>2</sup> increased N, P, K in roots, stems, and leaves and chlorophyll A, B and carotenoids contents in leaves as well as protein contents in green pods and dry seeds compared to control treatment, in both seasons. the mixed treatment seemed to be optimum in this concern. However, Pb contents in roots, stems, leaves, green pods and dry Seeds were .decreased by remediation treatments application in both seasons

The interaction effects of lead levels and remediation treatments -<sup>2</sup> reflected some significant effects on the studied chemical contents of roots, stems, leaves, green pods and dry seeds. At higher pb level mixed .and super phosphate treatment gave the higher mean values

The obtained results indicated generally that application of mixed or super phosphate treatments, to lead polluted soil might be considered as an optimal treatment for the production of high yield and good quality of common bean, under the prevailing environmental conditions of Behera Governorate and other similar regions. Also, this study provides an evidence about the possibility using remediation treatments to minimize lead hazard , decrease pollution and produce safe products.