

Effect of lead and cadmium on germination and seedling growth of soybean (*Glycine max* L.)

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This study was conducted to determine the effect of different concentrations of lead and zinc on seed germination and seedling growth of soybean plant (*Glycine max* L.). Seeds were grown under laboratory conditions at (0, 0.5, 2.5, 4.5 and 6.5 mM) of lead (II) chloride and different concentrations of zinc chloride (5, 10, 15 and 20 mM). Both lead and zinc treatments showed toxic effects on seed germination percentage of soybean. With increasing concentration of lead chloride to 6.5 mM, significantly ($p < 0.05$) decreased seed germination as compared to control. However, in comparison with the control treatment, the lowest germination percentage determined at 5 mM zinc in the level ($P < 0.05$). The decrease of 58.24 and 73.17% in germination rate was noticed following the treatment with 4.5 and 6.5 mM lead chloride compared with control treatment, respectively. But, zinc chloride increased germination rate over control at 5 mM, however by increasing zinc concentration, the speed of germination was significantly decreased in comparison with the control. Lead was found to penetrate thick seed coat of this plant and affects its germination and growth rate. Soybean plant is a non-tolerant plant to lead during its germination and initial growth. The toxic effects of lead may be observed in low concentrations (5 mM) since they significantly reduce germination percentage. The decrease in seed germination can be attributed to alterations of selection permeability properties of cell membrane. Also, it seems that soybean plants cannot be tolerated by these elements because of their genetic and inductive ability. The reason for low tolerance against both metals might be due to change in the physiological mechanism in seed germination and seedling growth of plant.