

THE PALLIATIVE EFFECT OF BIO-ORGANIC FERTILIZER ON LEAD POLLUTION IN *Lycopersicum esculentum* PLANTS

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ABSTRACT

Lead is one of the hazardous heavy metal pollutants of the environment that originates from various sources. Soil contamination by lead reduces the quality of both soil and cultivated plants which often limits the production of some food products and animal feed. Thus, this study was undertaken to evaluate the effect of a bio-organic fertilizer, namely Acadian, a red algal extract, at recommended dose (RD) in alleviating the deteriorative effect of Pb at 0, 50, 100, 200 and 400 mg/l on tomato (*Lycopersicum esculentum*) plants. Accordingly, Pb-treated plants showed marked reductions in growth measurements as root and shoot length, fresh and dry weights of shoots and fruits as well as number of leaves and fruits, in photosynthetic rates, stomatal conductance, net intercellular CO₂ rates (Δ CO₂) and in the contents of each of chlorophyll a, b and total chlorophyll. In addition, with the increase in level of Pb treatment in situ, total sugars, total nitrogen, catalase activity and major nutrient elements (P, K, Ca and Mg) were proportionally declined in both shoots and roots as well as proline of roots. On the other side, Pb treatment raised the levels of each of carotenoids, total soluble sugars, amino nitrogen, total soluble nitrogen, peroxidase, superoxide dismutase, phenols, lipid peroxidation, sodium, lead & iron in both roots and shoots of tomato plants as well as proline of shoots and transpiration rates. When tomato plants were supplemented with the recommended dose of Acadian solely or combined with Pb at all rates, significant increases in all measured growth parameters (shoot and root length, fresh and dry weights of shoots, roots and fruits, number of leaves and fruits), photosynthetic rates, stomatal conductance, Δ CO₂, the contents of each of chlorophyll a, b, total chlorophyll as well as the contents of total sugars, total soluble sugars, total nitrogen, total soluble nitrogen, amino-N, P, K, Ca and Mg in

tomato shoots and roots were obtained. Conversely, Acadian fertilization negatively reduced the carotenoid values, the activity of antioxidant enzymes(catalase, peroxidase and superoxide dismutase), the amounts of phenol, Pb, Na, Fe and the level of lipid peroxidation in both shoots and roots of tomato plants, whereas, it positively affected transpiration rates. On the other side, when Acadian was added to lead at different rates there were either synergistic increases in the activities of these antioxidant enzymes and the level of phenol and lipid peroxidation or decreases in the carotenoid, Na, Fe and Pb contents as well as transpiration rates. Thus, it is manifested that Acadian can be used to improve the safety, quality and productivity of lead polluted plants.

Key words: Pollution, Lead, Tomato, Bio-organic Fertilizer.