

Effect of Different Arsenic Treatments on Root Growth of Sunflower Seedlings in Rhizobox Experiment

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Abstract : Arsenic (As) is a naturally occurring substance that can be present in soil, water and air. Vegetables, fruits, and other plants that grow in contaminated soils which are able to accumulate arsenic. Arsenic when presents in plant cells, has various negative physiological effects and when presents in soil will be inorganic form, namely arsenite (As(III)) and arsenate (As(V)). These two forms of arsenic disrupt plant metabolism by inhibiting its growth and these arsenic species has negative effect on nutrient uptake. A rhizobox experiment was conducted to investigate the effect of arsenite and arsenate on root growth of sunflower seedlings. Sunflower plants were grown in climatic room under irradiance of $300 \mu\text{mol m}^{-2} \text{s}^{-1}$, 16-h day and 8-h night photoperiod, day/night temperature of 25/20°C and relative humidity of 65-75%. We applied arsenic in form of arsenite (NaAsO_2) and arsenate (KH_2AsO_4), respectively. The applied arsenic treatments was 0, 10, 30, 90 mg.kg^{-1} . After disinfection, seeds were germinated between moist filter papers. Seedlings with 2-3 cm coleoptils were placed into rhizoboxes. In the rhizoboxes the growing and daily growing rhythm of roots of sunflower can be followed up, moreover possible phytotoxic symptoms of roots resulting from increasing arsenic can be seen. Weights of rhizoboxes were measured daily and also evaporated water added each day. The lengths of roots were measured daily until seedlings roots get at the end of the rhizoboxes. Negative correlation was observed between the higher concentration of arsenic in the soil and the growth of sunflower seedlings roots. The effect of arsenic toxicity was more considerable in 90 mg.kg^{-1} arsenic treatment than lower concentration. The same arsenite concentration causes slower growth in case of sunflower plant than the same arsenate concentration produced.

Keywords : arsenic, rhizobox experiment, sunflower, root growth

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