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## Cadmium and chromium concentrations in the root zone soil, roots and leaves of Spinach (*Basella alba*) cultivated using chemical fertilizers

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Spinach (*Basella alba*) is traditionally planted without the use of fertilizers. However, increased demand by consumers has resulted in mass scale cultivation of *B. alba* by adding chemical fertilizers. Being a high metal accumulating plant, there is a potential to build up toxic metals in the edible portions of *B. alba*. Therefore, the present study was conducted to assess the total cadmium (Cd) and chromium (Cr) concentrations in the root zone soil, roots and leaves of *B. alba*. Plants were grown with and without fertilizers in individual pots containing sandy loam soil. About 10g of solid fertilizer from the mixture (Urea, MOP and TSP = 2:1:1) was added to plants after two weeks of transplanting seedlings in pots. Cd and Cr concentrations in root zone soil ( $Cd_{soil}$  and  $Cr_{soil}$ ), roots ( $Cd_{roots}$  and  $Cr_{roots}$ ) and leaves ( $Cd_{leaves}$  and  $Cr_{leaves}$ ) of *B. alba* were analyzed by atomic absorption spectrophotometry (detection limit:0.01 mg/L) by sampling 10 samples from each type during three sampling events (4 weeks, 8 weeks and 12 weeks after fertilizer application). Two sample t-test ( $p < 0.05$ ) in MINITAB 17 software was used for the comparison of metal concentrations in fertilizer applied and fertilizer not applied samples. Mean Cd and Cr concentrations in the chemical fertilizer applied samples were higher than those of fertilizer not applied samples. Highest mean concentrations were recorded as;  $Cd_{soil}:1.9\pm0.2$  mg/kg,  $Cr_{soil}:19.7\pm0.5$  mg/kg;  $Cd_{roots}:2.8\pm0.2$  mg/kg,  $Cr_{roots}:22.4\pm0.7$  mg/kg;  $Cd_{leaves}:3.4\pm0.2$  mg/kg,  $Cr_{leaves}:23.4\pm0.9$  mg/kg). The mean Cr concentrations were greater than the mean Cd concentrations in all the samples. Cr and Cd concentrations in the leaves of *B. alba* collected from fertilizer applied pots exceeded the safe limits for consumption recommended by WHO/FAO (Cr:2.3 mg/kg, Cd:0.2 mg/kg). The mean bio-concentration factors of Cd and Cr were greater than one (highest values Cd:1.9±0.2 and Cr:1.2±0.1) indicating that there is a possibility of contamination Cd and Cr in the edible parts of *B. alba* due to urea, MOP and TSP applications.

**Keywords:** Heavy metals, bio-concentration factor, hyper-accumulator, fertilizer applications, safe limits for consumption

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