

Hydroponic cultivation of selenium-enriched kale seedling and speciation of selenium with HPLC–ICP-MS

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Abstract

Kale (*Brassica oleracea* var. *alboglabra* L.) seedlings were selected for cultivation as Se-enriched vegetable by a hydroponic system. Se-enriched kale seedlings were grown in Hoagland's solution supplemented with 5, 10, 15, 30 and 45 $\mu\text{g mL}^{-1}$ Se (IV) from sodium selenite for 15 days and harvested every 5 days. Cultivation of kale seedlings with 45 $\mu\text{g mL}^{-1}$ Se inhibited the growth rate and Se accumulation. However, total Se concentrations of all Se-supplemented treatments were higher than that of control treatment. The highest Se concentration accumulated by kale approximately 400 $\mu\text{g g}^{-1}$ Se (expressed as Se in dry matter) was obtained in the kale which was grown with 30 $\mu\text{g mL}^{-1}$ Se in solution. Se Speciation studies indicated that the pre dominant forms of organic Se are selenomethionine (SeMet), Se-methylselenocysteine (SeMC) and unknown which were identified in 0.1 M HCl in 10% methanol extracts by ion pairing reversed phase HPLC–ICP-MS. Moreover, almost 100% of Se in the extract was found to be non-metabolized selenite when harvested longer than 15 days. Thus, it is possible to produce Se-enriched seedling with the method proposed.

Keywords: Reversed phase HPLC–ICP-MS; Se-enriched kale seedling; Se speciation