Rhizofiltration Potential of Cyanocobalamin in Lactuca sativa var. Capitata to Increase B12 Concentration

Zajkowski, Jacob (School: Anthony Wayne High School)

The future of food production involves physiological growing adaptions to nutrients that will increase the nutritional value of crops. This study tests the ability of lettuce biofortification of cyanocobalamin (CN-CBL) that could be a source of vitamin B12, especially for elderly populations and vegetarian diets with cobalamin malabsorption issues. For the experimental methods, lettuces were grown in nutrient film technique growing systems for 45-day experimental trials that tested the effectiveness of direct accumulation of CN-CBI, a cellular modification for a nutrient increase, and eventually, a combining a genetically modified population of lettuce from plant tissue culture with direct accumulation of CN-CBI to enrich the crop in vitamin B12. Five u/mol of CN-CBI served as the concentration standard for bioaccumulation effort. The micronutrient concentration of cobalt, which serves as the base protein and identifier of CN-CBL, was deemed unrecognizable with <0.25ppm when tested through ICP-spectrometry in the direct accumulation trials. Modification included increasing the reaction rates of H+ Cells with the use of a deionized water supply stimulation in the crop's rhizosphere. The change in net ionization of the roots indicated 7 of the 12 nutrients tested to have an increase in micronutrient metal uptake by roots. In conclusion, when direct accumulation was used with the H+ cell modification, cobalt increased +0.75 mg/kg in dry weight, compared to the non-modification grown lettuce that still contained <0.25 mg/kg of Co. The hypothesis that direct accumulation would be effective was supported, however metal nutrient toxicity will have to be further tested for a production agriculture application.

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