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

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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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