Influence of nickel nutrition and nitrogen source on growth and yield of lettuce in hydroponic culture

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(Received : May 1-2011 ; Accepted : December 31-2011)

Abstract

Nickel (Ni) is the most recently discovered essential element for higher plants. But there is limited information about the effect of this element on yield and nitrogen (N) metabolism of different plants. In this research, the interaction of Ni supplement and N source was studied on nitrate accumulation and growth of lettuce (*Lactuca sativa* L. cv. Baker) in solution culture. In a greenhouse experiment, lettuce plants were exposed to two Ni levels (0 and 0.04 µM in the form of $NiCl_2$) and three N levels (5, 10, and 20 µM in the form of urea and ammonium nitrate). The plants were harvested 6 weeks after transplanting and the fresh weight of shoots and roots, total N concentration, nitrate concentration and Fe content of shoots were determined. The results indicated that shoot and root fresh weight of nitrate-fed plants were higher than urea-fed plants. Ni nutrition significantly enhanced the yield of urea-fed plants. The shoot nitrate concentration in nitrate-fed plants was significantly greater in comparison with urea-fed plants. On the other hand, nitrate concentration in the shoots of lettuce plants decreased significantly with Ni nutrition. Ni supplementation in urea-fed plants increased the shoot Fe content. The shoot concentration of total-N in the urea-fed plants increased with the Ni supplement. While, Ni had no significant effect on shoot concentration of total-N in the nitrate-fed plants. Addition of low levels of Ni to the nutrient solution, particularly to the urea-containing solution, improved the yield of lettuce. In addition, these plant leaves are safer for human consumption because the shoot nitrate content is significantly reduced by application of Ni.

Keywords: Urea, Micronutrients, Nitrate, Nickel.

[DOR: 20.1001.1.20089082.1391.3.1.4.2]

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