Abstract

Assessment of Cyanobacterial Biomass as Sustainable Agricultural Fertilizer: Soil Experiment with Plants in Pot †

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Abstract: Providing food to the growing human population in a sustainable way is one of the greatest challenges of modern society. In this context, cyanobacterial biomass (CB) can function as a source of macronutrients to increase soil productivity. These organisms can be collected from the environment in considerable amounts, since they tend to grow in large blooms. However, some of these cyanobacterial strains produce toxins that need to be carefully monitored to avoid food accumulation. The objective of this work was to evaluate the possible use of toxic and non-toxic strains of CB as fertilizer supplement in the growth of economically relevant vegetables. One-month-old Raphanus sativus (radish) and Spinacia oleracea (spinach) plants were grown in pots in indoor controlled conditions. Six experimental conditions were set: (1) a control with no nutrient addition, (2) a recommended dose of a NK commercial fertilizer (CF), 0.6 g of lyophilized CB of (3) a non-toxic strain of cyanobacteria of the shoot in the mineral content of plant edible parts. The mineral content in CB was estimated and compared with the recommended dose of CF, according to the information given by the fabricant label. We found no significative differences in N composition; nevertheless, there was a significative higher content in P and significative lower content in K in the CB. In the plants, we found no significative statistical differences between the treatments for the dw of radish root and spinach height. In spinach, the dw of the shoot in the M. aeruginosa treatment was significantly lower than the control, CF, and both the toxic and non-toxic C. raciborskii biomass. Additionally, in radish, the plant height and dw of the shoot M. aeruginosa treatment were significantly lower than in the toxic strain of C. raciborskii treatment. When analyzing mineral content in edible parts, we found that spinach treated with control and CF showed a higher content of Ca, Mo, N, P, and K, while in radish, the same two treatments plus the C. raciborskii toxic had higher Co and Fe content. M. aeruginosa amendment seems to impair shoot growth in both plant species. On the contrary, the toxic C. raciborskii CB seems to have a beneficial effect on growth and in mineral uptake on radish plants.
Keywords: radish; spinach; fertilizer; Anabaena; Cylindrospermopsis; Microcystis

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