

Tecniche colturali in ortofloricoltura

Exploiting waste streams for a circular economy of nutrients in soilless systems

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Reinforcing and optimizing sustainable food production is an urgent contemporary issue. Diminishing the depletion of natural resources is intensively studied, and efforts are exerted towards integrating non-renewable resources such as potassium and phosphorous and energy-costing elements like nitrogen with recycled nutrients when boosting agricultural production. The approach of a closed-loop fertility cycle asserts the necessity for efficient natural resource management. For this purpose, eight urine derivatives (liquid and precipitates) were integrated in the fertilization program of a greenhouse soilless cultivation of lettuce (*Lactuca sativa* L.) cv. Grand Rapids, in order to assess the inputs of this nutrient rich waste stream. Treatments were compared in terms of growth, biometric parameters, SPAD index, minerals and organic acids content. Two solid urine derivatives (K-struvite and urine precipitate-CaO) and one liquid derivatives (ED concentrate) fostered similar growth to the commercial fertilizer. ED concentrate induced a high accumulation of potassium, calcium, malate, citrate and isocitrate while K-struvite induced high accumulation of magnesium when compared to the control. The appraisal of nitrogen- and phosphate-rich organic streams (human urine), in order to sustain chemical fertilization to grow lettuce in soilless systems, showed promising results as the integration of urine derivatives proved feasible. Nonetheless, future research is needed in order to reduce Na and Cl presence in these derivatives, due to their deleterious effects on horticultural crops grown in soilless systems.

Keywords: sustainable fertilization, nutrient recovery, urine precipitate, *Lactuca sativa* L.