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Biofortification of Swiss chard baby leafy greens with selenium and iodine in indoor vertical farming systems

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Agrifood systems are currently facing scrutiny due to their capacity to address the challenges posed by population growth, climate change, and depletion of natural resources. Consequently, addressing food insecurity and malnutrition has become a significant focus of the UN's 2030 Agenda for Sustainable Development. One critical aspect of human nutrition is the deficiency of essential micronutrients like selenium and iodine (the so-called hidden hunger), which affects billion people worldwide and leads to severe health issues [1]. Climate change can further exacerbate this problem by reducing the levels of these elements in the soils and, consequently, in food crops [2]. Swiss chard (*Beta vulgaris* subsp. *cicla*) is an herbaceous leafy vegetable consumed worldwide and popular for its year-round availability and affordability. It is rich in antioxidants and the leaves and stalks contain high quantities of chlorophyll and betalain pigments, dietary fiber, and micronutrients such as vitamins A and C and minerals such as calcium, iron, and phosphorus [3].

This study aims to address these scientific questions by developing sustainable biofortification methods for Swiss chard baby leafy greens in vertical farming systems. To achieve this, the combined effects of different concentrations of selenium and iodine forms in the nutrient solution and variable blue-red LED light ratios on the production of baby leafy greens will be investigated [4]. After harvest, the plants will be characterized for morphophysiological, phytochemical, nutritional, and bioactive parameters using a wide range of analytical techniques and *in vitro* cell-based assays [5,6]. The efficiency of biofortification will be assessed through bioaccessibility and bioavailability studies of the target micronutrients [7].

This transdisciplinary research is expected to develop sustainable techniques to improve the nutritional status of Swiss chard baby leafy greens through biofortification in controlled-environment vertical farms. The anticipated outcomes have the potential to catalyse the development of innovative food production processes, ultimately leading to the creation of more sustainable, healthier, and nutrient-rich plant foods.

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