SHORT-TERM SCIENTIFIC MISSION PROPOSAL

ACTION NUMBER: COST-1204

STSM TITLE: Reduction of nickel translocation from roots to shoots in tomato by grafting onto *Solanum* rootstocks

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Introduction

Heavy metal contamination in soil and water is currently one of the most troublesome environmental problems faced by mankind nowadays. The risks for human health that is associated with heavy metal contamination in agricultural products has prompted closer examination of their presence in soils, their uptake and translocation to different plant parts in particular fruits, as well as their impact on plant growth and physiological processes. It is well known that excessive concentrations of some heavy metals (e.g. Cd, Ni) in edible plant parts may occur in the absence of visible symptoms, thereby encumbering their detection. Moreover, heavy metals may cause toxicity even when they are present at low concentrations in the root environment. To eliminate or at least mitigate the adverse effects of heavy metals on their metabolism, plants have evolved different defense mechanisms aimed at minimizing their absorption or detoxifying them when they enter into plant tissues. The efficiency of defense mechanisms based on uptake control depends mainly on the root genotype. Unfortunately, the efficiency of many elite cultivars of fruit vegetables to exclude heavy metals and enhance nutrient uptake when exposed to heavy metal stress is low. According to recent studies, grafting was a useful technique to increase plant vigor and yield, induce higher tolerance to biotic and

abiotic stress conditions such as salinity, nutrient stress, thermal stress, water stress, organic pollutants, and alkalinity, and also improve fruit quality. In relation to heavy metal tolerance, few studies have been carried out to determine the response of grafted plants, so investigations whether grafting would enhance the heavy metal tolerance of vegetables are highly needed as basic requirement for the continued success of grafting. Based on the above considerations the main objective of this STSM project is to verify if grafting an important vegetable crop such as tomato onto appropriate rootstocks, may limit the nickel accumulation in the aerial parts in particular fruits, thereby mitigating their adverse effects on crop performance and human health.

Materials and Methods

The experiment will be carried out in the Summer 2013 season, in a in a 300 m^2 polymethylmethacrylate greenhouse situated on the Experimental Farm of Tuscia University, Central Italy. The treatments will be defined by a factorial combination with three nickel concentrations in the nutrient solution (control 0 mM, 0.1, or 0.5 mM), and four grafting combinations (a control self grafted; or grafted onto Beaufort, Maxifort and Black beauty an eggplant rootstock). Each experimental unit will be consisted of nine plants. The treatments will be arranged in a randomized complete-block design with three replicates per treatment.

During the experiment, the following parameters will be measured:

- Yield and yield components (total, marketable yields, fruit mean weight and fruit number),
- Biomass measurements and partitioning(leaves, stems, fruits, roots and harvest index),
- Quality parameters (fruit dry matter, total soluble solids contents, Hunter color, firmness, shape index, acidity and pH),
- Physiological parameters (electrolyte leakage and relative water content in leaf, SPAD index, chlorophyll fluorescence),
- Mineral analysis (macro N, P, K, Ca, Mg and microelements Cu, Zn, Mn, Fe, B, and Cd) in different plant tissues such as leaves, stems, fruits and roots.