P39 – How strong is the influence of different nitrogen sources on iron uptake of grapevine rootstocks?

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Abstract

Grapevine (*Vitis vinifera L.*) is the most economically important deciduous fruit crop in the world. Iron (Fe) is an essential micronutrient for plant development since its active form is involved in several biochemical processes, e.g., chlorophyll synthesis. The uptake of the elements depends on individual elements' interactions. Iron (Fe) nutrition of plants can be significantly affected by different nitrogen (N) forms through altering the uptake ratio of cations and anions, and changing rhizosphere pH. It is known, that most crop species grow best with access to nitrate (NO_3^-) as well as ammonium (NH_4^+) nitrogen, but little attention has been paid to changes in iron uptake under supply of different nitrogen (N) forms. The presented study aimed to decipher the specific interaction of different nitrogen (N) forms on Iron uptake of different grapevine rootstocks on the physiological as well as on the biochemical and molecular level. Four NH_4^+: NO_3^- ratios (0:1,1:5, 1:3, 1:1) were tested with a modified half-strength Hoagland solution with and without FeNa(III)-EDTA, summing up to eight treatments within a hydroponic system (Kick-Brauckmann, 7.5 L) under semi-controlled climatic glasshouse conditions in 2021. Rooted woody cuttings of the rootstocks Fercal (*V.berlandieri* x *V. vinifera*) and Couderc 3309 (*V. riparia* x *V. rupestris*) were used for the experiment. The results could differentiate iron deficiency effects, nitrogen form effects and rootstock effects. Biomass of leaves was negatively influenced by iron absent in both rootstocks with nitrate as only N source. This effect was observed for 3309C for all NH_4^+: NO_3^-ratios, while with Fercal the biomass of leaves increased with increasing amount of NH_4^+. A similar trend was overserved for root biomass, promoting in Fercal with increased NH_4^+ amount and not response in 3309C. The efficiency of the photsystem II (Y(II)) decreased under iron deficient conditions in both rootstocks showing the strongest effect with only nitrate as N source especially with rootstock 3309C. Increasing ammonium levels in the nutrient solution lead to a higher pH reduction by the rootstocks probably enhancing the Fe^{2+} availability and uptake. The ferric chelate reductase (FCR) activity was specifically increased in Fercal under iron-deficient conditions, while no effect was observed for 3309C in comparison to control plants. These first results of the study indicate that rootstocks differ in their preference on both the physiological and molecular level depending on the nitrogen form and in interaction with iron deficiency stress. In a next step the molecular mechanism will be analysed.

Keywords: grapevine, rootstock, nitrate, ammonium, iron, ferric chelate reductase