Effects of iron on efficiency and map of photosystem II photochemical yield of rose flower using chlorophyll fluorescence imaging

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Abstract

Interveinal chlorosis induced by iron deficiency is considered to be one of the problems in rose production in greenhouses all over the world. This experiment was conducted to elucidate the capability of chlorophyll fluorescence imaging technique to recognize early iron deficiency and also determination of relationship between leaf iron concentration and leaf chlorophyll content index and photosystem II photochemical efficiency of rose flower *(Rosa hybrida* L., cv. First Red). Rose plants were grown and subjected to 5 levels of iron (1.5, 3, 6, 12 and 24 μM) based on randomized complete blocks design with 4 replicates in hydroponic greenhouse of Wageningen University, The Netherlands. The results revealed that increased concentration of iron in nutrient solution from 1.5 to 24 μM led to the meaningful increase of average photosystem II photochemical efficiency from 0.062 to 0.590 ($P<0.01$). This was clearly obvious in the map of photosystem II photochemical yield of rose leaves. The results indicated significant ($P<0.05$) correlations between leaf iron concentration and leaf chlorophyll content index ($r= 0.91$) and average photosystem II photochemical efficiency ($r= 0.85$). Also, a significant correlation ($P<0.05$) was found between leaf chlorophyll content index and photosystem II photochemical efficiency ($r=0.86$). The results clearly demonstrated that it is possible to detect early hidden hunger of iron in rose flower with the use of chlorophyll fluorescence imaging and therefore increasing the yield and quality of rose flower in greenhouses.

Keywords: Iron, Photosynthetic system II, Photochemical efficiency, Chlorophyll fluorescence, Rose flower.

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