

Fe plays an essential role in the photosynthetic processes of plants. Iron deficient plants show limitations in growth, biomass production and ultimately in yield. The synthesis of chlorophylls is also negatively affected and carotenoid pigments take precedence, thus the leaves turn yellow or chlorotic. In practice, iron deficiency is rarely caused by the general lack of the element itself. Rather, it may form biologically inaccessible, stable precipitates due to unfavourable chemical conditions in the soil, thus its uptake may only proceed through high affinity pathways. Alkaline pH, strong buffering effect and an oxidative environment normally present under such conditions all hinder the mobilization of iron compounds and the acidification of the rhizosphere by the plant. In the modern-day agriculture, Fe is mostly supplemented via highly stable chelates, however prolonged treatments have proven to be environmentally harmful. For this reason, safe and reliable sources of iron and other microelements need to be developed.

In our experiments, we explored the possibilities of using Fe-humicin, a medicinal iron supplement as an Fe source in hydroponic cultures. Using Mössbauer spectroscopy, we determined that the ascorbic acid added to the product does indeed contribute to keeping the Fe ions in a reduced state, which may in turn improve their bioavailability. The plant experiments were conducted on cucumber (*Cucumis sativus* L. cv. Joker), in hydroponic culture, on $\frac{1}{4}$ strength Hoagland nutrient solution. The product has been shown to be a potent source of iron in a wide range of concentrations on slightly acidic pH, similarly to our controls (Fe-citrate and Fe-EDTA). In the plants treated with Fe-humicin, biomass production, chlorophyll and carotenoid concentrations, as well as the maximum quantum efficiency of photosystem II have all been determined to be superior to iron deficient controls, and comparable to controls supplied with iron. However, on alkaline pH, Fe-EDDHA, a potent iron source along a wide pH-range outperformed the product, while humicin-treated plants performed better than their Fe deficient peers. Further experiments are being conducted to determine the impact of Fe-humicin made with and without ascorbic acid on high affinity Fe uptake pathways by measuring Fe-chelate reductase activity.