EU Cost Action FA1306 - The quest for tolerant varieties: phenotyping at plant and cellular level

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OC11 **Multispectral imaging combined with conventional analysis for early stage identification of Fe deficiency in soybean (*Glycine max* L.)**

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Iron (Fe) is an essential nutrient for several vital biological processes. However, under alkaline soil conditions, Fe is poorly bioavailable and leads to Fe deficiency, a serious condition that can hinder crop growth and productivity in about one third of the world´s agricultural soils. An early detection is extremely important in order to introduce corrective measures and prevent production losses. Conventional detection methods are expensive, slow, destructive, and untimely. Here we evaluated the potential of multispectral technology and compared it to conventional phenotyping methods. Plants with differential susceptibility were grown under Fe sufficiency and deficiency and were phenotyped at different time points using multispectral imaging (covering the visible and near-infrared spectral regions), and calculating the corresponding spectral indexes. SPAD readings, organ weight, leaf area, photosynthetic pigment content, ferric reductase activity, and mineral content were also measured. Reflectance values per se were able to distinguish healthy and Fe deficient plants. For tolerant plants, two λ allowed discrimination, whereas for susceptible plants, reflectance values were discriminatory at nine λ. Reflectance values were then compared to the biochemical data, and total chlorophylls, as well as chlorophylls a and b displayed high correlations at 575 and 625 nm, indicating that multispectral imaging can be a useful tool for future field identification of Fe deficiency.