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A Low Cost Miniature Method to Determine Iron Content in Samples Suitable for Small Research Laboratories

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Abstract

The determination of iron contents in plant or soil samples is relatively laborious and involves expensive equipment such as a high-pressure acid digestion system and an atomic absorption spectroscope. The method requires relatively large amounts of sample material and due to the costs involved only a limited number of samples can be analysed per day. Therefore, this method is in many cases unsuited for laboratories of small research or field stations. In order to reduce sample size required as well as costs and equipment requirements we developed an analytical method that uses micro titer plates and a plate reader. As test materials rice tissue samples were used from an experiment on genotypic tolerance to iron toxicity. Individual samples size was between 0.03 and 0.15 g. Samples were finely ground using a self made ball mill with achate balls to avoid iron contamination at milling. Samples were extracted by heating to 120 °C in a pressure cooker, filtered and pipetted onto a micro titer plate. Sodium dithionite was added to reduce all iron present to FeII, and the wells were filled up with 2,2 Dipyridil, which forms a stable red complex with FeII. Micro titer plates were read in a plate reader at 490 nm. The accuracy of the method was tested by comparing the results with data obtained by the original standard method from the same sample. The method will be tested for soil extracts in the near future. The new provides a way to determine the iron content of plant tissue samples on the basis of small sample sizes for less then a tenth of the costs of the original standard method. Implications of the new method for the use in small low budget laboratories will be discussed.

Keywords: Iron complex, iron determination, mikro titer plates, miniature analytics, photometry, rice