

---

## Contents

<i>Preface</i> . . . . .	<i>v</i>
<i>Contributors</i> . . . . .	<i>ix</i>
1 Roles and Functions of Plant Mineral Nutrients. . . . . <i>Frans J.M. Maathuis and Eugene Diatloff</i>	1
2 Plant Growth and Cultivation . . . . . <i>Dorina Podar</i>	23
3 Protocols for Growing Plant Symbioses; Mycorrhiza . . . . . <i>Michael Schultze</i>	47
4 Protocols for Growing Plant Symbioses; Rhizobia . . . . . <i>Benjamin Gourion, Marie Bourcy, Viviane Cosson, and Pascal Ratet</i>	61
5 Plant Cell Suspension Cultures . . . . . <i>Roberto Moscatiello, Barbara Baldan, and Lorella Navazio</i>	77
6 Soil Analysis Using Visible and Near Infrared Spectroscopy . . . . . <i>Johanna Wetterlind, Bo Stenberg, and Raphael A. Viscarra Rossel</i>	95
7 Mineral Composition Analysis: Measuring Anion Uptake and Anion Concentrations in Plant Tissues . . . . . <i>Malcolm J. Hawkesford, Saroj Parmar, and Peter Buchner</i>	109
8 Multielement Plant Tissue Analysis Using ICP Spectrometry. . . . . <i>T.H. Hansen, T.C. de Bang, K.H. Laursen, P. Pedas, S. Husted, and J.K. Schjoerring</i>	121
9 Mapping Element Distributions in Plant Tissues Using Synchrotron X-ray Fluorescence Techniques . . . . . <i>Erica Donner, Martin D. de Jonge, Peter M. Kopittke, and Enzo Lombi</i>	143
10 Flux Measurements of Cations Using Radioactive Tracers . . . . . <i>D.T. Britto and H.J. Kronzucker</i>	161
11 Ion Flux Measurements Using the MIFE Technique . . . . . <i>Sergey Shabala, Lana Shabala, Jayakumar Bose, Tracey Cuin, and Ian Newman</i>	171
12 Sampling and Analysis of Phloem Sap . . . . . <i>Sylvie Dinant and Julia Kehr</i>	185
13 Methods for Xylem Sap Collection . . . . . <i>M. Alexou and A.D. Peuke</i>	195

14	Plant Single Cell Sampling . . . . .	209
	<i>Wieland Fricke</i>	
15	Measurements of Cytosolic Ion Concentrations in Live Cells. . . . .	233
	<i>Veena S. Anil, Kavitha P.G., Sam Kuruvilla,</i> <i>Pavan Kumar, and M.K. Mathew</i>	
16	Real Time Measurement of Cytoplasmic Ions with Ion-Selective Microelectrodes . . . . .	243
	<i>Anthony J. Miller</i>	
17	Large-Scale Plant Ionomics . . . . .	255
	<i>John M.C. Danku, Brett Lahner, Elena Yakubova,</i> <i>and David E. Salt</i>	
18	Applications of High-Throughput Plant Phenotyping to Study Nutrient Use Efficiency . . . . .	277
	<i>Bettina Berger, Bas de Regt, and Mark Tester</i>	
	<i>Index. . . . .</i>	291



<http://www.springer.com/978-1-62703-151-6>

Plant Mineral Nutrients

Methods and Protocols

Maathuis, F.J.M. (Ed.)

2013, XI, 297 p., Hardcover

ISBN: 978-1-62703-151-6

A product of Humana Press