

Horticulture 601

Horticultural Plant Nutrition

Fall Semester 2005

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Lecture Schedule

Lecture	Date	Topic	Study material
1	8/30	<i>Course Introduction</i>	
2	9/1	<i>Plant nutrients</i> <ul style="list-style-type: none"> - Definition of essentiality of elemental nutrients - Classification of elemental nutrients - Physiological functions of elemental nutrients 	Handouts Marschner, Ch. 1 Epstein, Ch.1
3	9/6	<i>Short distance transport</i> <ul style="list-style-type: none"> - Structure and function of biological membranes - Diffusion - Fluxes across membranes - Passage into the cytoplasm and the vacuole - Ion channels - 	Handouts Marschner, Ch. 2
4	9/8	<i>Short distance transport II</i> <ul style="list-style-type: none"> - Active transport: electronic pumps - ATPases - Nernst equation - Symport and antiport - Apoplasm and symplasm - Structure and function of plasmodesmata - Kinetics of transport 	Handouts Marschner, Ch. 2
5	9/13	<i>Short distance transport III</i> <ul style="list-style-type: none"> - Feedback regulation and luxury uptake <i>Ion uptake by roots</i> <ul style="list-style-type: none"> - Pathway of solutes from external solution into roots Root anatomy as related to development - Influx into the apparent free space - Sites of ion uptake by roots - Pathways for radial transport across the root - Regulatory mechanisms of ion uptake and transport in roots - Interaction between ions: competition, the role of pH, ion synergism and the role of Ca²⁺ 	Handouts Marschner, Ch. 2

Lecture	Date	Topic	Study material
6	9/15	<i>Transport of solutes via the xylem</i> <ul style="list-style-type: none"> - Xylem anatomy and ontogeny - Equations describing xylem transport - Regulation of ion transport via the xylem - Positive root pressure and guttation 	Handouts Marschner, Ch. 3
	9/20	FIRST EXAM	
7	9/22	<i>Phloem translocation of elemental nutrients</i> <ul style="list-style-type: none"> - Phloem anatomy - Phloem loading and unloading 	Handouts Marschner, Ch. 4
8	9/27	<i>Phloem translocation of elemental nutrients</i> <ul style="list-style-type: none"> - Biophysics of phloem transport - Ionic concentrations in phloem solution Remobilization of elemental nutrients <i>Uptake and release of mineral elements by leaves and other aerial plant parts</i> <ul style="list-style-type: none"> - Uptake by leaf cells - Leaching of mineral elements from leaves 	Marschner, Ch. 4
9	9/29	<i>Yield and the source-sink relationship</i> <ul style="list-style-type: none"> - Photosynthesis and related processes - Leaf senescence <i>Mineral nutrition and yield response</i> <ul style="list-style-type: none"> - Leaf Area Index and net photosynthesis - Mineral nutrition supply, sink formation, and sink activity - Tuberization <i>Shoot-root communication and rapid signaling system</i> <ul style="list-style-type: none"> - Electrical and hydraulic signaling - Action potentials 	Handouts Marschner, Ch. 5, 6
10	10/4	<i>Nitrogen</i>	Marschner, 8.2
11	10/6	<i>Nitrogen</i>	Marschner, 8.2
12	10/11	<i>Nitrogen fixation</i>	Marschner, Ch. 7
13	10/13	<i>Sulfur</i>	Marschner, 8.3
		<i>Phosphorus</i>	Marschner, 8.4
14	10/18	<i>Magnesium</i>	Marschner, 8.5
	10/20	SECOND EXAM	
15	10/25	<i>Calcium</i>	Marschner, 8.6
16	10/27	<i>Potassium</i>	Marschner, 8.7
17	11/1	<i>Iron</i>	Marschner, 9.1
18	11/3	<i>Manganese</i>	Marschner, 9.2-9.3
		<i>Copper</i>	

Lecture	Date	Topic	Study material
19	11/8	<i>Zinc</i> <i>Nickel</i>	Marschner, 9.4-9.5
20	11/10	<i>Molybdenum</i> <i>Boron</i>	Marschner, 9.6-9.7
	11/15	THIRD EXAM	
21	11/17	<i>Chlorine</i> <i>Beneficial mineral elements</i> <i>Diagnosis of deficiency and toxicity of mineral nutrients</i> <ul style="list-style-type: none"> - Nutrient supply and growth response - Diagnosis of nutritional disorders by visible symptoms - Plant analysis - Histochemical and biochemical methods - Plant analysis versus soils analysis 	Handouts Marschner, Ch. 10 and Ch. 12
22	11/22	<i>Nutrient availability in soils</i> <ul style="list-style-type: none"> - Chemical soil analysis - Movement of nutrients to the root surface - Role of root density - Nutrient availability and distribution of water in soils - Role of soil structure - Intensity/quantity ratio, plant factors, and consequences for soil testing 	Handouts Marschner, Ch. 13
23		<i>Effect of internal and external factors on root growth and development</i> <ul style="list-style-type: none"> - Carbohydrate supply - Root morphology, hormonal interactions - Soil chemical factors - Rhizosphere microorganisms - Soil physical factors - Shoot/root ration 	Marschner, Ch. 14
	11/24	NO CLASS (Happy Thanksgiving!)	
23	11/29	<i>Foliar application of mineral nutrients</i> <i>Controlled-release fertilizers</i> <i>Fertigation</i> <i>Adaptation of plants to adverse chemical soil conditions</i> <ul style="list-style-type: none"> - Waterlogged and flooded soils - Salinity 	Handouts Marschner, Ch. 16
24	12/1	<i>How to apply what you have learned to the real world Part I – Dealing with container-grown plants</i> (Dr. Dave Reed)	Handout
25	12/6	<i>How to apply what you have learned to the real world Part II – Dealing with local soils</i> – (Dr. Doug Welsh)	Handout
	12/09	FOURTH EXAM (12:30 - 2:30)	