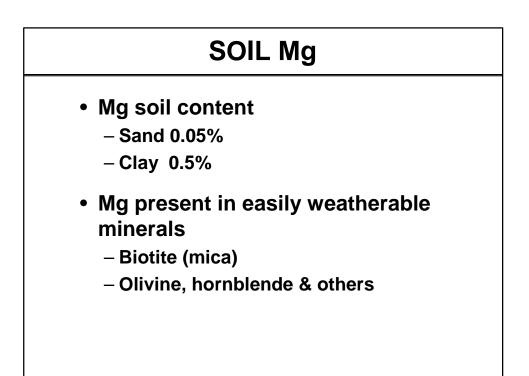
BIOL 695

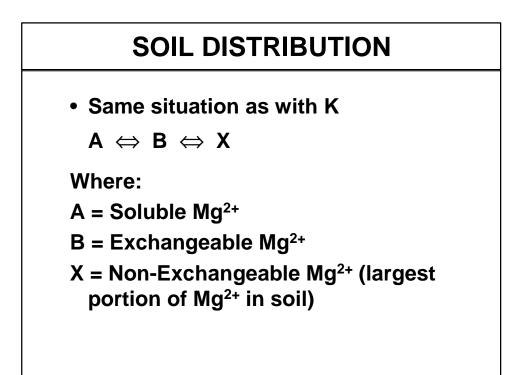
MAGNESIUM

Chapter 12 MENGEL et al, 5th Ed



SECONDARY CLAY MINERALS

- Clay minerals (reserve Mg)
 - Vermiculite
 - Illite
 - Montmorillonite
- Chemical form of Mg
 - MgCO₃ magnesite
 - Dolomite CaMg(CO₃)₂
 - MgSO₄ kieserite

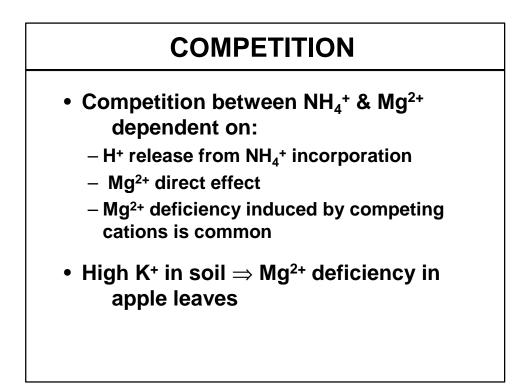


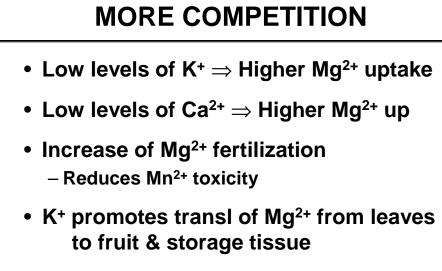
CATION EXCHANGE CAPACITY

- Percentage of CEC
 - Ca 80%
 - Mg 2 to 20%
 - K 5%
- Mg is leached similarly to Ca, rates related to soil type

UPTAKE

- Small divalent cation
 - Mg²⁺ hydrated ionic radius = 0.428 nm
 - more or less 0.5% in plant tissue
- Roots have less ability to uptake Mg in comparison to K
- Relatively high conc's of Mg in soil solution
- Threshold values are published for many plants





• Mg²⁺ mobile in phloem; Ca²⁺ is NOT.

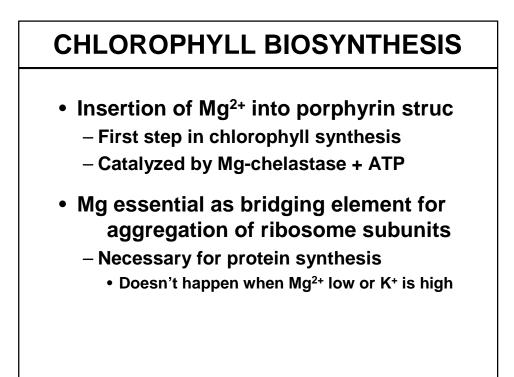
Mg IN CHLOROPHYLL

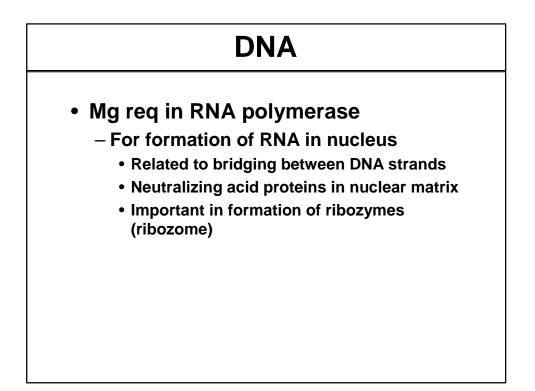
- Mg²⁺ central ion in chlorophyll (Fig. 1.3)
- Proportion of total Mg bound in chlorophyll depends on Mg supply.
 - -6 25% of total Mg in chlorophyll
 - -5-10% in cell wall pectates
 - Small amount in vacuoles
 - Remainder of Mg is water extractable

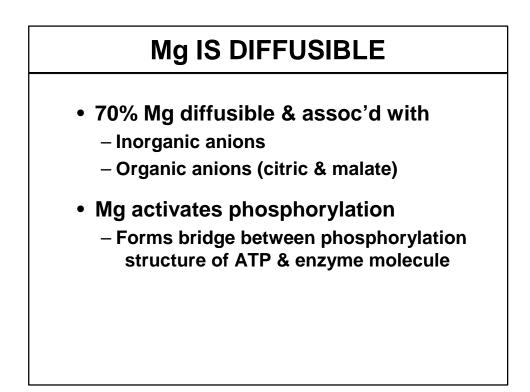
CHLOROPHYLL TAKES PRECEDENCE

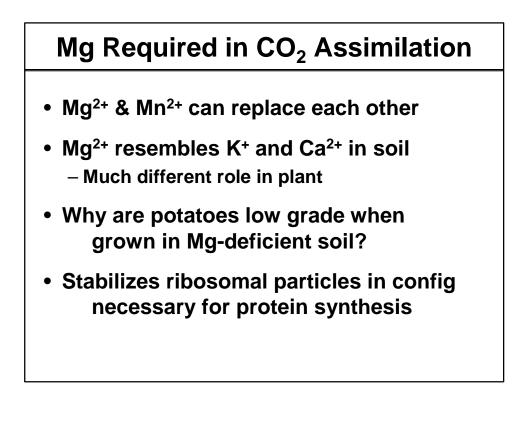
- Mg²⁺ bound in chlorophyll might be as high as 50% in low light.
- Chlorophyll takes precedence

 Content depends on availability of Mg²⁺









Mg DEFICIENCY

- Mg²⁺ req'd in plant is optimum at - 0.15 - 0.35% Dry Weight Basis
- Protein N down
 - Non-protein N up in deficient leaves
- Mg²⁺ mobile thus deficiency where?
 - Enhances protein degradation
 - Other pigments also affected
- Starch accumu In Mg deficient chloroplasts
 - Responsible for increase in dry matter of Mg deficient leaves

DEFICIENCY SYMPTOMS

- Interveinal yellowing chlorosis
- Confused with virus yellowing
- May appear withered as in K deficiency
- Stiff & brittle leaves
- Abscise prematurely
- See Mg Deficiency slides in BIOL 695
 Deficiency Symptom CD-1

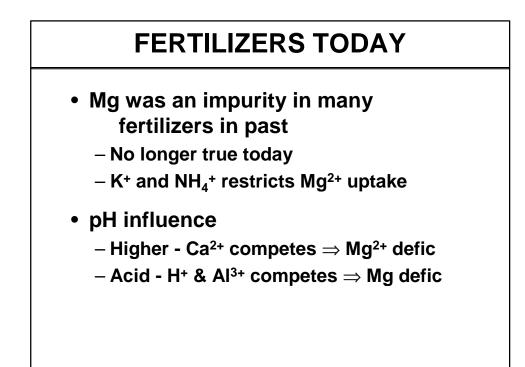
CROP REQUIREMENTS

- Applying Mg beyond growth-limiting level results in Mg being stored in vacuoles
 - Acting as buffer in metabolic pool
 - Charge compensation & osmoregulation in vacuole

TOO MUCH Mg IN DROUGHT

- High Mg in leaves (1.5%) critical under drought stress
 - As leaf water potential drops
 - Mg conc increases from 3 to 5 mM to 8 -13 mM
 - Such high concentration in stroma of chloroplasts inhibits PS

COMPARATIVE USE OF Mg		
Crop	Kg of Mg / Ha	
Potatoes	7	
 Tomatoes 	12	
Cabbage	9	
Oil Palm	38	
Coconut	12	
• Tea	3	



Mg FERTILIZERS

- Applied as:
 - MgCO₃ magnesite
 - dolomite best to lime acid soils Ca & Mg (dolomitic limestone reacts more slowly)
 - MgO
 - MgSO₄ More effective & expensive
 - Epsom salt effective as foliar spray
- See list of Mg fertilizers in Table 12.4