

**BIOL 695**

## **MOLYBDENUM**

**Chapter 17**  
**MENGEL et al, 5th Ed**

### **SOIL Mo**

- **From 0.6 to 3.5 ppm total Mo**
  - **Available for plants ~ 0.2 ppm**
- **Appears as an oxyanion  $\text{MoO}_4^{2-}$** 
  - **Highest oxidized form [Mo VI]**
  - **More like  $\text{HPO}_4^{2-}$  and  $\text{SO}_4^{2-}$**
- **Adsorption to soil particles decreases with higher pH**
  - **Thus more available to plant at high pH**

## **REQUIREMENT**

- **Less than for any other essential ion**
- **Function related to valency changes**
- **Cofactor to enzymes**
  - **Nitrate reductase**
  - **Nitrogenase**
  - **Xanthine oxidase/dehydrogenase**
  - **Sulfite reductase**

## **CLOSELY RELATED TO**

- **Nitrogen metabolism**
- **Mo requirement depends on N form**

## **NITROGENASE**

- All biological systems fixing  $N_2$ 
  - Require nitrogenase
    - Each nitrogenase molecule
      - Contains 2 Mo atoms
- $N_2$  is bound to Mo & electrons fed stepwise, degrading Mo-nitrogenase

## **NITROGENASE**

- $N \equiv N$  by protonation
  - Until 2 molecules of  $NH_3$  are released
- Mo content in nodules higher than leaves when external Mo supply low
- Mo content in leaves gen exceeds that of nodules when Mo sufficient

## **NITRATE REDUCTASE**

- **Contains**
  - **Heme Fe**
  - **2 Mo atoms**
- **NRA low in Mo-deficient plants**
  - **Induced in few hrs with ad'n of Mo**
- **NO<sub>3</sub> accumulates in Mo defic plants**

## **NITRATE REDUCTASE**

- **Mo uptake greater in presence of**
  - **NO<sub>3</sub>-N than in NH<sub>4</sub>-N**
  - **Plants grown with NH<sub>4</sub>-N**
    - **May not require Mo**
- **Under sterile cond grown with NH<sub>4</sub>**
  - **Did NOT develop Mo def symptoms**
- **Non-sterile cond Mo def symptoms developed. WHY?**

## **DEFICIENCY SYMPTOMS**

- Resembles N deficiency
- Old leaves chlorotic first
- Necrotic leaf margins
  - Caused by  $\text{NO}_3^-$  accumulation
- Citrus - Yellow spots
- *Cruciferae* - grey-green limp upper.
  - Extreme cases - Only mid rib
    - “Whiptail”