North American Carbon Program

Continental Carbon Budgets, Dynamics, Processes, and Management

GLOBE Carbon Cycle

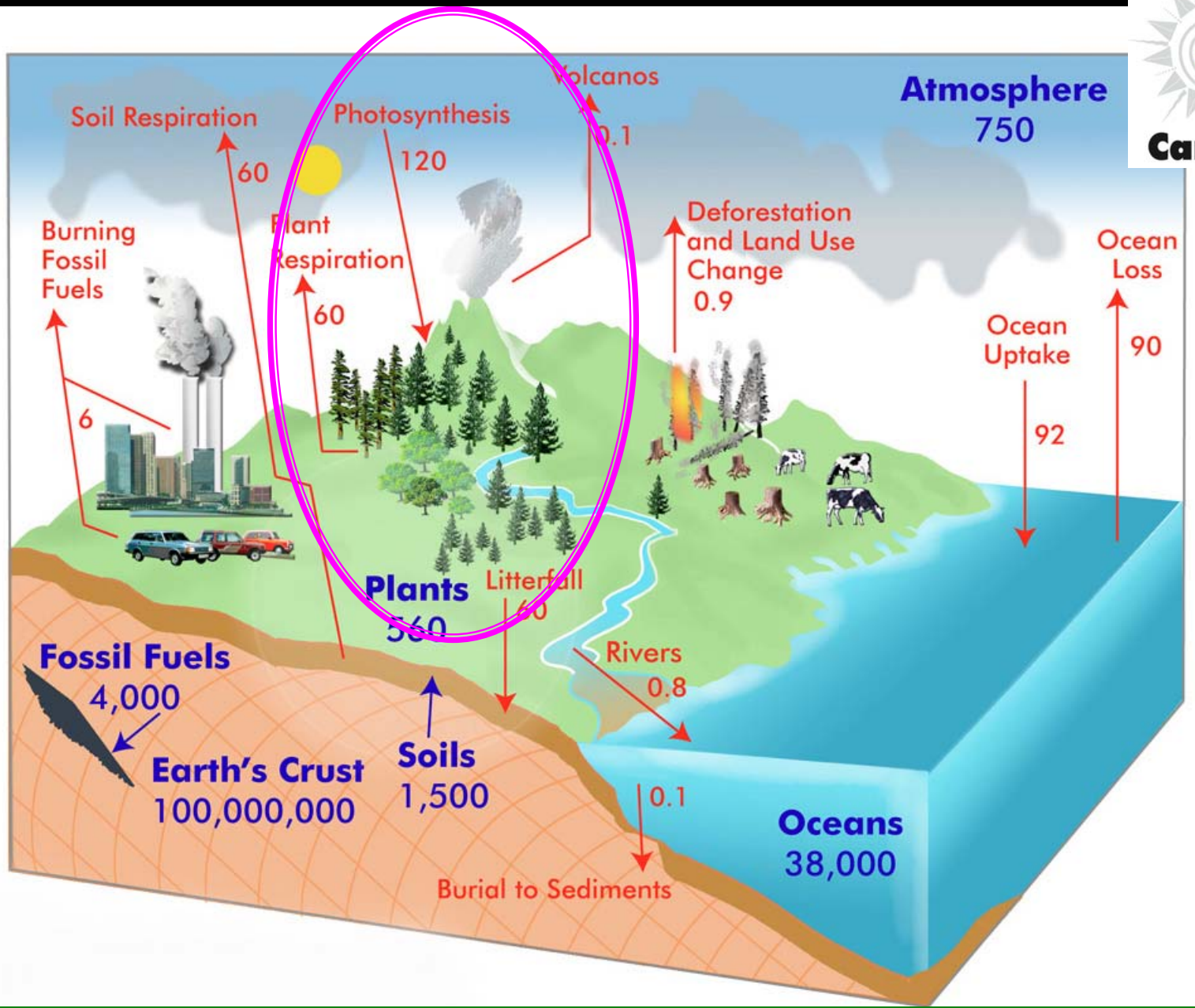
GLOBE Carbon Cycle:

Integrating NASA Carbon Cycle Science with GLOBE education

Scott Ollinger, Jana Albrechtova, Lara Gengarelly, Mary Martin, Annette Schloss, Rita Freuder, Sarah Silverberg *and* Gary Randolph

Global Carbon Cycle: Role of Plants

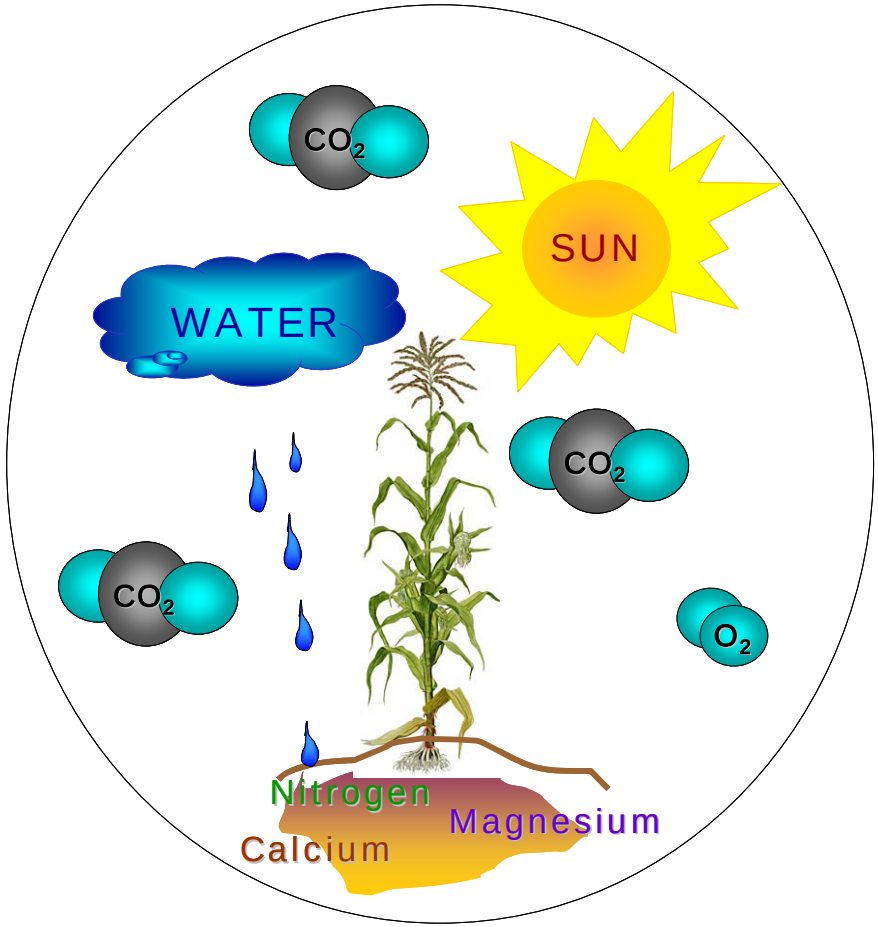
GLOBE Carbon Cycle



Global Carbon Cycle: Role of Plants

The basic question:

What do the Plants Need to Grow?



And How the Plants are Connected to Global Carbon Cycle?

Proposed Activities Under Development

GLOBE Carbon Cycle

1. Global Carbon Model
2. Field Measurements
3. Remote Sensing Toolkit
4. PnET Ecosystem Model
5. Plant-a-Plant Experiments

- Hands-on activities: range of cultivation experiments with real plants
- Experiments are designed for different levels of difficulties
- Exploration and validation of necessity of sources determining plant growth
- Demonstration that CO_2 is incorporated into plant biomass
- Understand changes in carbon storage at the ecosystem rather than global level

Czech Collaboration - **Project team**

Charles University of Prague,Faculty of Science

Project coordinator and PI: Jana Albrechtová

Associate Professor, Head of the Department of Plant Physiology

Administration: Zuzana Lhotáková

TEREZA Association,

NGO focused on environmental education, coordinator of GLOBE project in Czech Republic; www.terezanet.cz

Project coordinator: Dana Votápková

Administration: Kateřina Čiháková, Barbora Semeráková

Plant-a-Plant Activity

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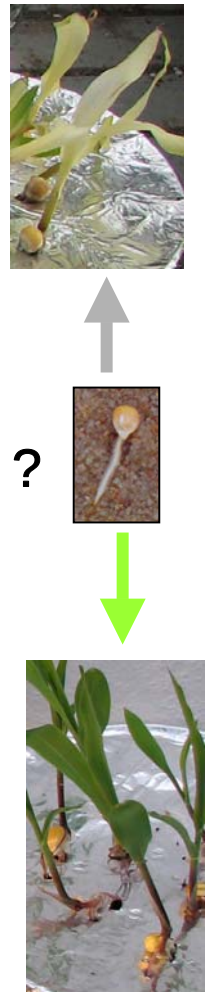
Developing easy experiments which should allow students to:

- Formulate their own hypotheses about plant growth and effects of different resources on it
- Conduct experiments based on given information
- Record observations and measurements
- Evaluate obtained data
- Make conclusions based on obtained data and evaluate the validity of the original hypotheses



Plant-a-Plant Activity

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Preconditions of the experimental design:

1. **Selected plant species should be available worldwide**
2. **Experiments should last up to 14-30 days**
3. **Low cost, high availability materials**

Solutions:

1. Maize
2. Tests in progress
3. Materials: laboratory scale, plastic pots or containers, plastic bottles, sand, ruler, alluminium foil.... commercially available fertilizer is being tested

Plant-a-Plant Activity

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Experiments on:

Experiment 1 - CARBON DIOXIDE

Question: How much CO_2 is needed for plant growth?

Experiment 2 – LIGHT

Question: Why do plants need light?

Experiment 3 – WATER

Question: Why do plants need to drink to be alive?

Experiment 4 – MINERAL NUTRIENTS

Question: why are nutrients needed for plant growth?

Plant-a-Plant Activity

GLOBE Carbon Cycle

All four experiments – one material:
Germinated Maize seeds

DAY 1

Maize seeds prepared for germination on water saturated sand

DAY 7

Maize seeds with root elongated enough, ready for cultivation

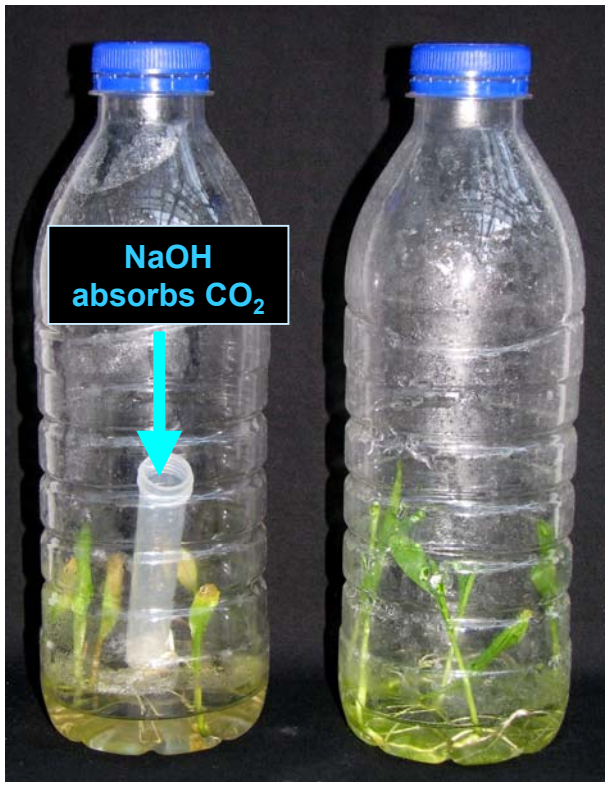
„Plant a Plant“ activity

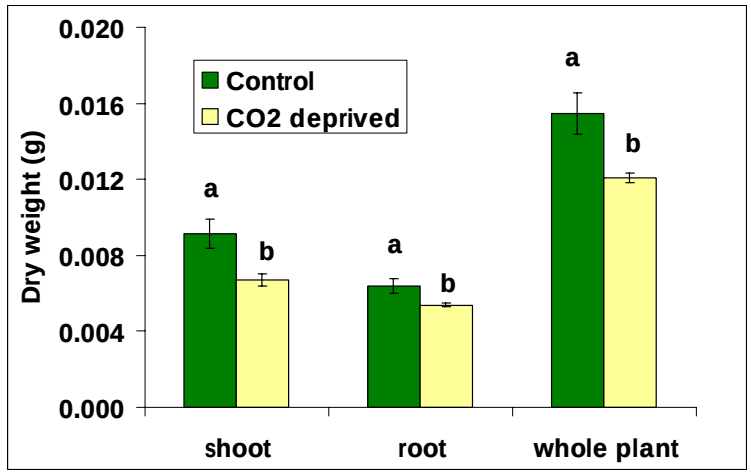
Experiment 1 - CARBON DIOXIDE

Question: How much CO_2 is needed for plant growth?

Experiment on maize grown in CO2 decreased atmosphere

Cultivation in 1 Liter milk bottles





✓ Reliable, statistically significant results

✓ Ready for classroom testing in school year 2007/2008

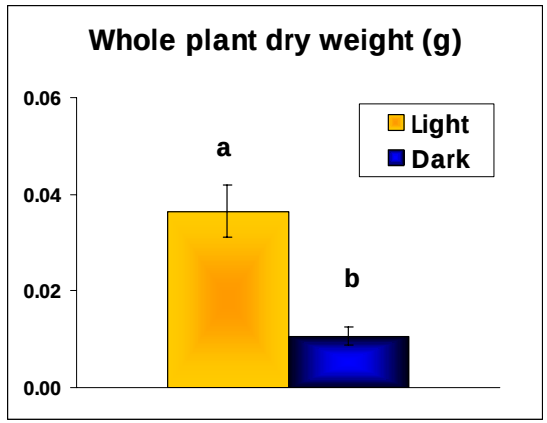
„Plant a Plant“ activity

Experiment 2 – LIGHT

Question: Why do plants need light?

Experiment on maize grown in dark

Cultivation in sand, dark treatment under flower pots or paper boxes



- ✓ **Reliable, statistically significant results**
- ✓ **Ready for classroom testing in school year 2007/2008**

„Plant a Plant“ activity

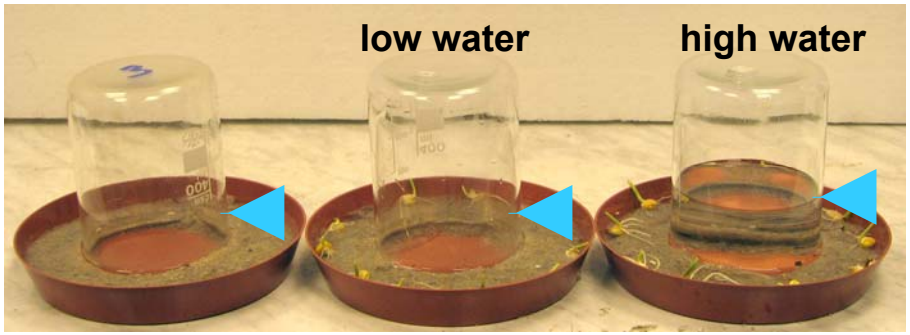
Experiment 3 – WATER

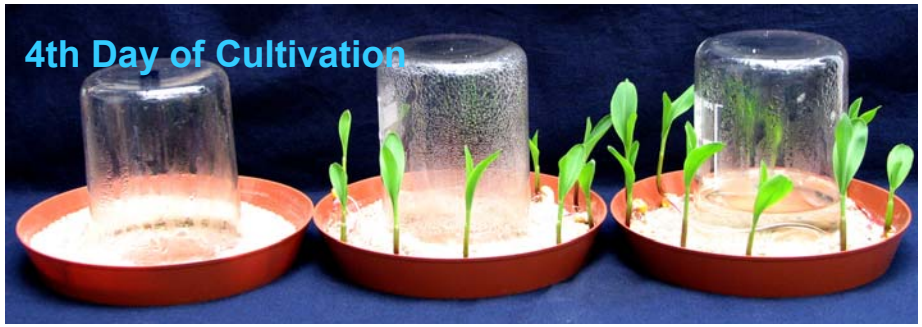
Question: Why do plants need to drink to be alive?

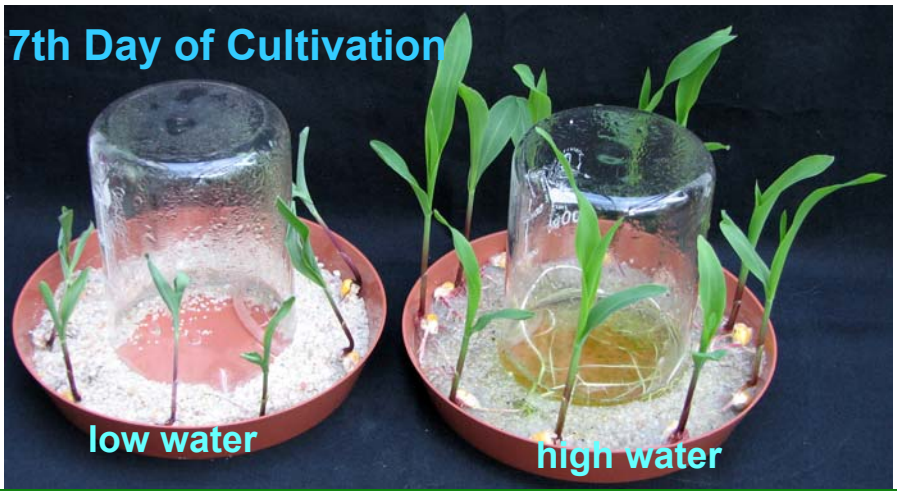
Experiment on maize grown with different water supply

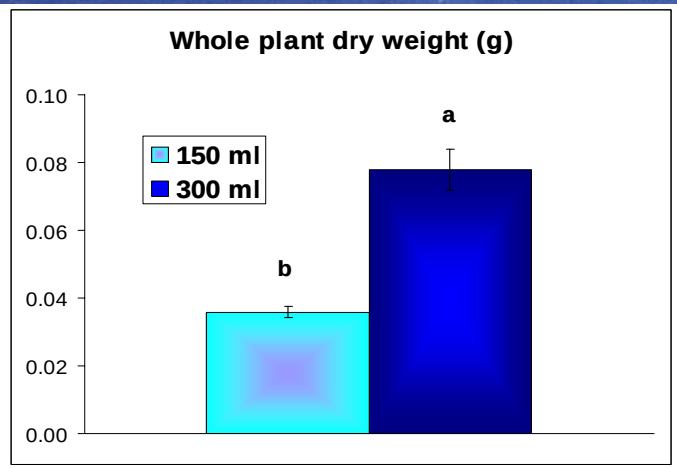
- ✓Reliable, statistically significant results
- ✓Ready for classroom testing in school year 2007/2008

Cultivation in sand, defined volume of water supply







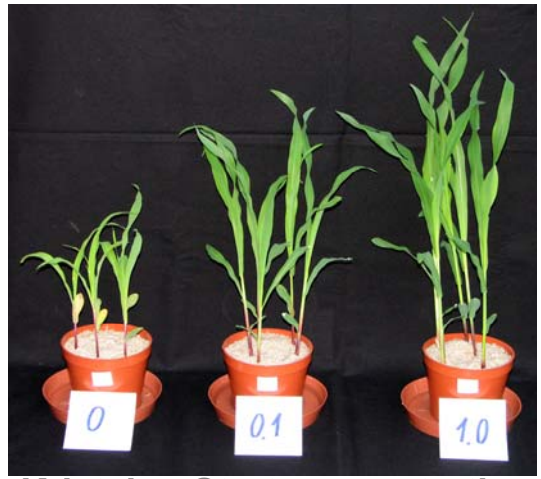


„Plant a Plant“ activity

Experiment 4 – MINERAL NUTRIENTS

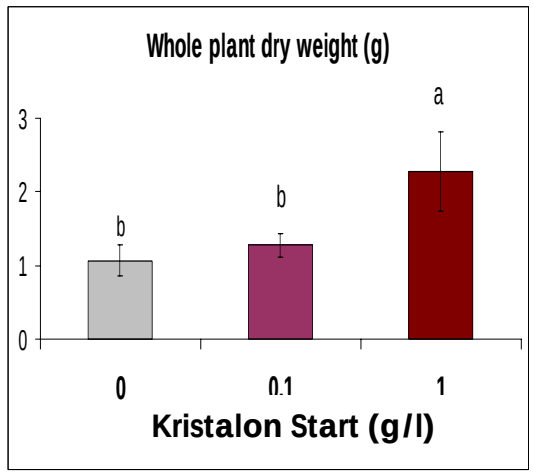
Question: why are nutrients needed for plant growth?

Experiment on maize grown in dark with increasing concentration of fertilizer



Kristalon Start concentration

Cultivation in sand in the pots, treatments with increasing concentration of complex fertilizer (Kristalon Start) in watering



- ✓ Reliable, statistically significant results
- ✓ Ready for classroom testing in school year 2007/2008

„Plant a Plant“ activity

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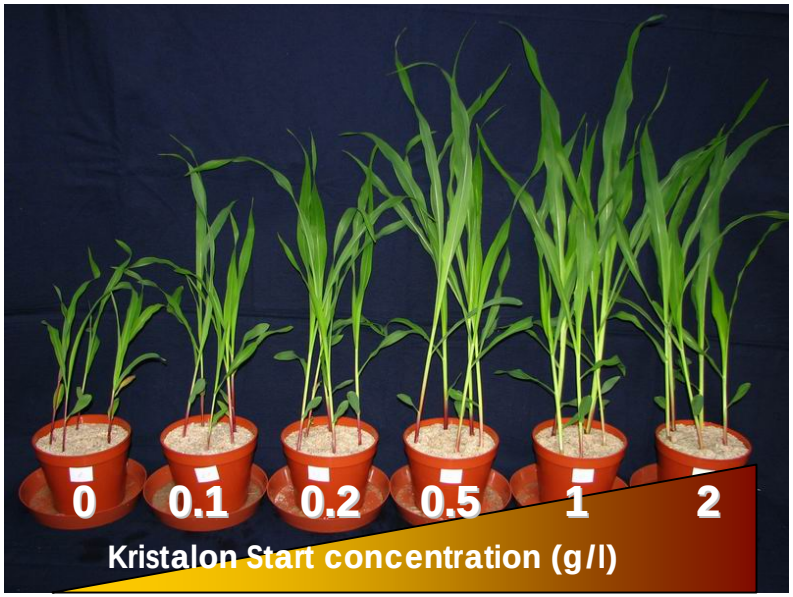
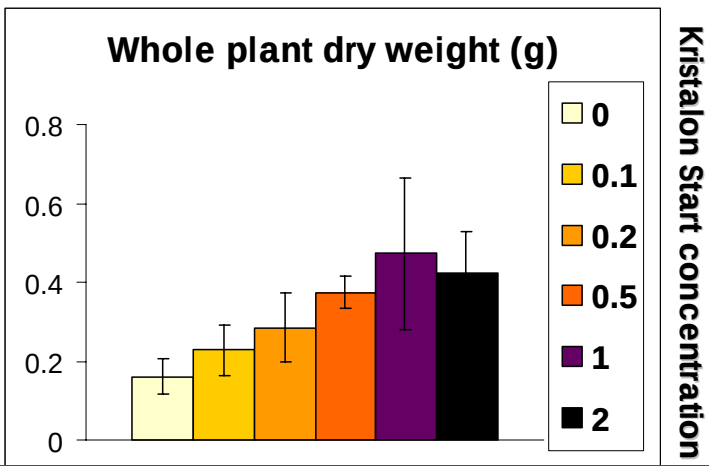
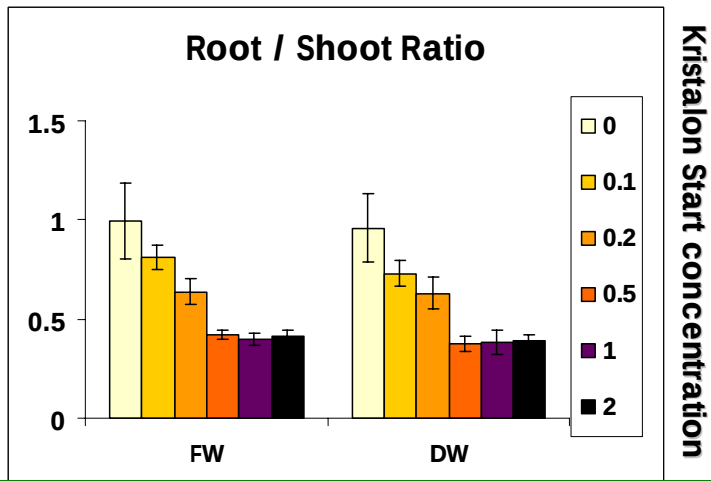
Experiment 4 – MINERAL NUTRIENTS







GLOBE Carbon Cycle

Teachers' Think Tank Workshop

Demonstration of Plant-a-Plant Activities

GLOBE Carbon Cycle Project
Czech Republic

Teachers' Think Tank Workshop

March 24-25, 2007, Prague

Charles University of Prague, Faculty of Science
Department of Plant Physiology

TEREZA Association (GLOBE coordinator in Czech Republic)

Teachers' Think Tank Workshop

Carbon Cycle Project Participants

= students and teachers of secondary schools experienced in GLOBE activities

Pilot 10 schools:

- from the Czech Republic and from the USA

- participate in evolving and testing new GLOBE protocols and activities of Carbon Cycle Project

Czech Collaboration –

Pilot Schools – Carbon Cycle Project participants

Schola Humanitas, Litvínov	www.humanitas.cz
Střední lesnická škola, Šluknov	www.lesnicka-skola.cz
Střední odborná škola a Gymnázium, Staré Město	www.szesgsm.cz
Česko-anglické gymnázium, České Budějovice	www.cag.cz
Gymnázium Kadaň	www.gymnazium-kadan.cz
Střední vinařská škola, Valtice	www.svisv.cz
SPŠP - COP, Zlín	www.isstzlin.cz
ISŠ - COP, Valašské Meziříčí	www.isscopvm.cz
Střední průmyslová škola, Karviná	www.sps-karvina.cz
Purkyňovo gymnázium, Strážnice	www.gys.cz

Czech Collaboration – **Web site**

http://kfrserver.natur.cuni.cz/globe/

Carbon Cycle Team – **We get ready!**