

TEACHER'S LAB RESOURCE

MATERIALS

FIGURES

GRAPH TABLES

FINAL GRAPHS

Seed Germination- Materials and Illustration

Research studies in all areas require the investigators to keep accurate and complete records of all details pertaining to the study. If the study's records are not complete and information is not entered, then the entire study could be viewed as meaningless. In science, study records are often recorded in a special journal called 'The Lab Notebook'. Scientists know that the information recorded in the Lab Notebook is vital to the success for the following reasons.

The Lab Notebook provides the investigator with a 'how to' way for repeating successful methods. If an investigator, for example, accidentally found a good way to make a plant container and wanted to repeat the 'accident' at a later time, the investigator would encounter a number of problems if accurate and detailed notes were not available.

The Lab Notebook also allows investigators to share their results and successful methods with other investigators. If lab team A, for example, finds that their plants are not growing very well and the team members notice that the plans from lab team B are growing very well, then team A could provide team B with useful information from their Lab Notebook that would help them with plant growth.

The Lab Notebook provides investigators with a way to examine their methods and equipment design before the investigators use the equipment or methods. The review of methods and equipment prevents the investigators from using flawed methods and/or equipment before these problems have a chance to cause actual damage.

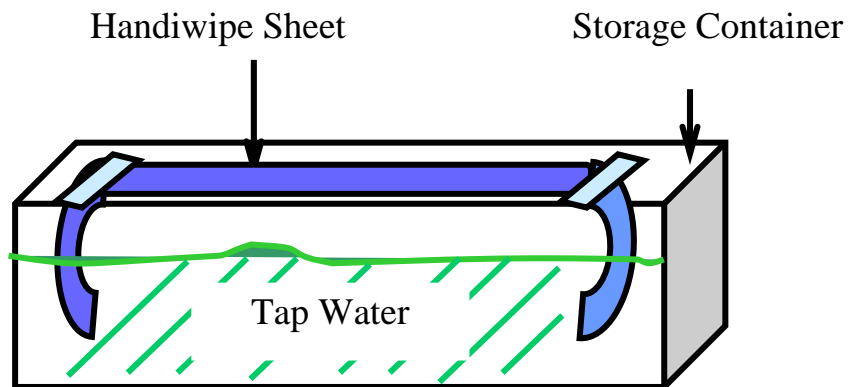
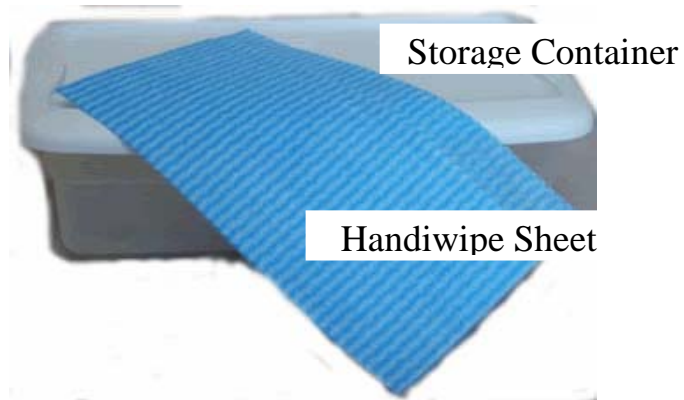
The Lab Notebook is vital in helping the study investigators convince investigators in other labs that their findings are valid. Other labs may need to repeat the results of the study before they are convinced that the results are true. If the other lab does not have all of the necessary study details they may be unable to repeat the study's results and will announce to other labs that the study's results are not valid.

Investigators in this lab are about to undertake an important study that may eventually help Earth's residents to adapt to the ongoing effects of Global Warming. For this reason, investigators need to be diligent in their efforts to create and maintain their Lab Notebooks.

Seed Germination- Materials and Illustration

| Seed Germinator Materials | |
|-------------------------------|-------------------------------------|
| Plant Name, variety, supplier | Broccoli, De Cicco, Morse Seed Co. |
| Seed package information | Large heads, high % of side shoots |
| Seed Sprouting Device | 4 Qt, storage container, Sterilite® |
| | Handiwipe® (Detergent free) |

Image and Drawing of Seed Germinator

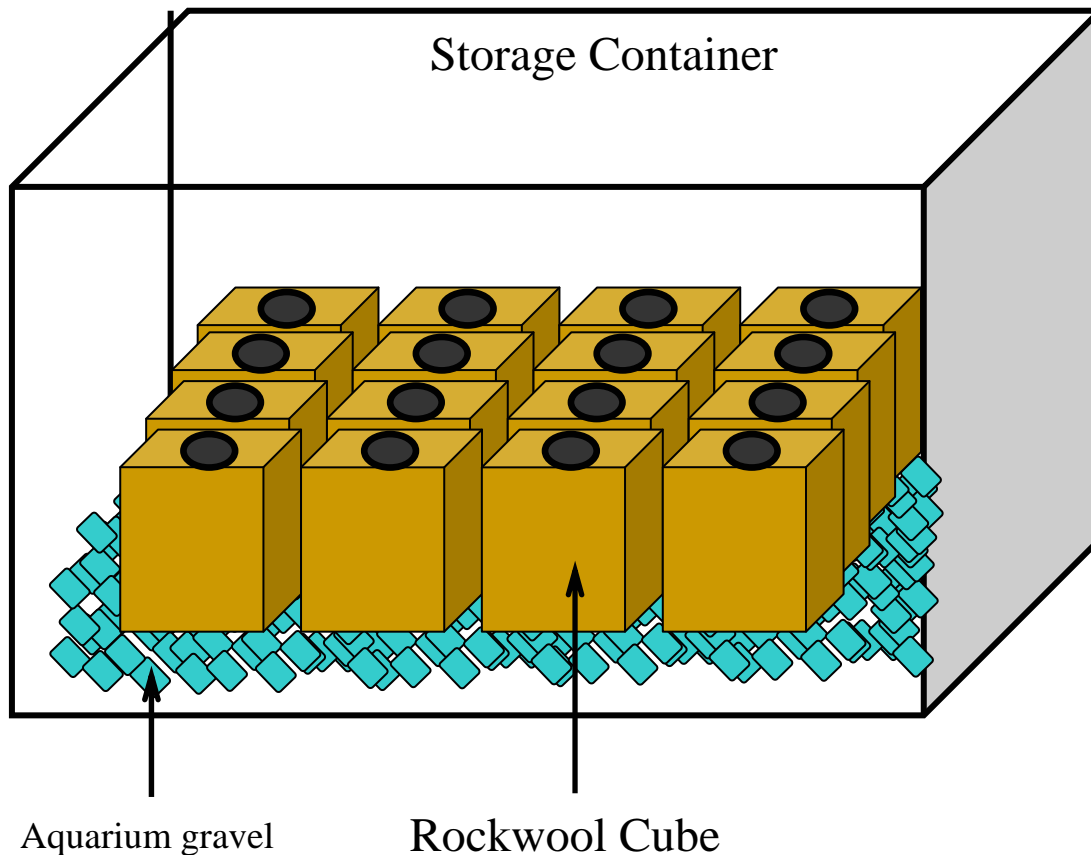


From Sprout to Plant- Preparation of the Nutrient Solution

Materials for Transferring Sprouts to Seedling Container

| | |
|------------------------------|--|
| Sprout Holder | Rockwool cube; (1.5" X 1.5" X 1.5") |
| Container for Rockwool Cubes | Gladware [®] storage container (739 mL) |
| Sprout Transfer Sticks | Toothpicks-various types |
| Sprout Holder Support | Aquarium or pea gravel |
| Light | 1- Light Unit per 16 sprouts |

Sketch of a Sprout Holder without a Light Unit



From Sprout to Plant- For Transferring the Sprout to the Sprout Holder

Plant Nutrient Solution Materials

| | |
|---|---|
| Brand Name and Manufacturer of Nutrient Concentrate | Ionic Bloom 3-2-6. Hydrodynamics International |
| Measuring nutrient concentrate | Graduated cylinder (50 mL) |
| Water Reservoir | Water can; (2.5 gal) |
| Nutrient solution mixing container | Plastic pitcher (2 L) |
| Nutrient solution stirring device | 12” Ruler, spatula, spoon. etc. |

Materials Used to Prepare the Nutrient

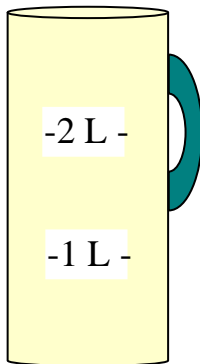
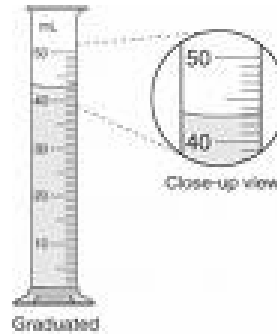
Nutrient Concentrate



2.5 Gallon Water Can



Graduated Cylinder
50 milliliters



Pitcher with 1 and 2 L
Volume Marks

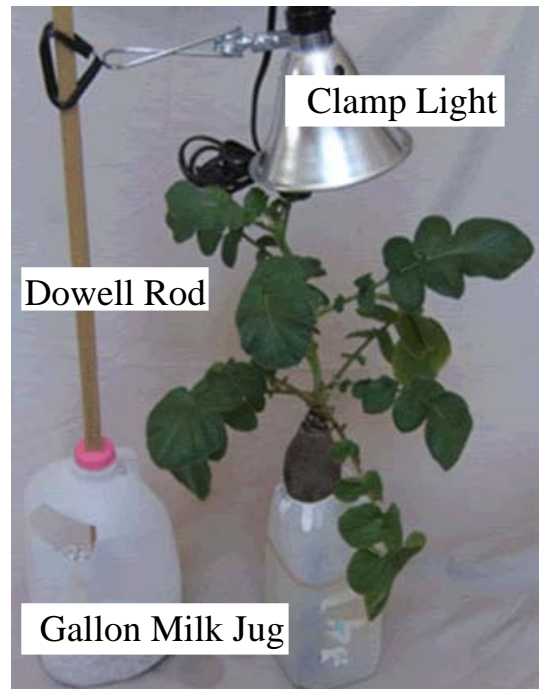
From Sprout to Plant- Preparation of the Nutrient Solution

Light Growing System Materials (per lamp unit) (one lamp unit used for each plant)

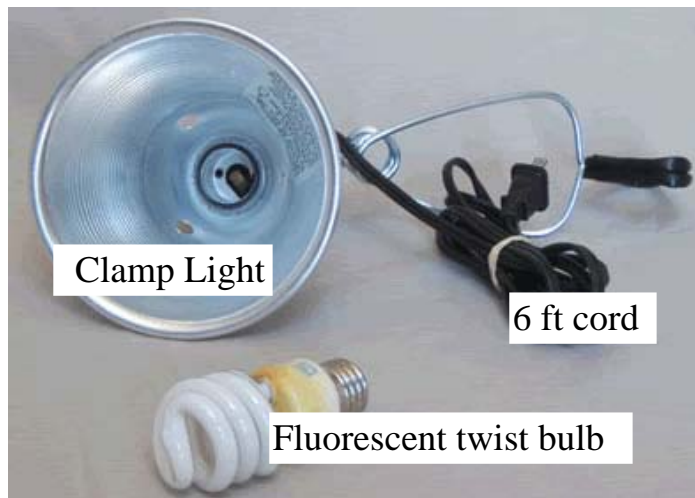
| | |
|----------------------------------|---|
| Light Holder Support Base | Gallon plastic milk jug. |
| Light Holder Support base weight | About 3000 grams (5-10 lbs) of aquarium or pea gravel |
| Light Source | Fluorescent Twist Bulbs (Bright Effects [®]) |
| | Output- 1600 Lumens: Watts Used- 23 |
| Light Source Holder | Clamp light with 6 ft, 10/2, SPT-1 cord (Rite-Lite [®]) |
| Light Source Holder Support | Dowell Rod-square, 5/8 in. X 36 in. |
| Light Source/Outlet Interface | 6-Outlet Power Strip |

Sketch and Label the Light Growing System

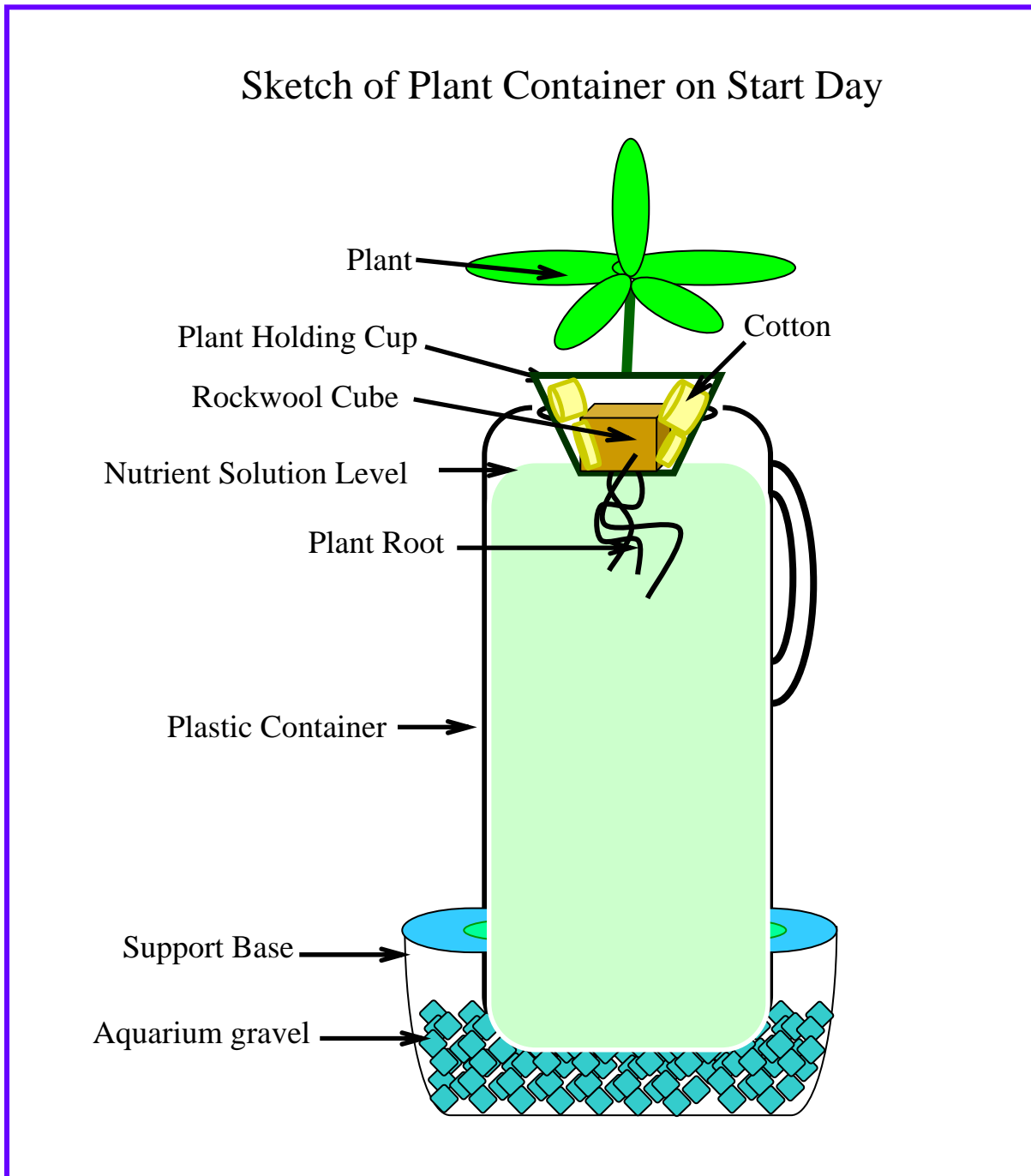
A Light Unit with Plant



Light Parts from a Light

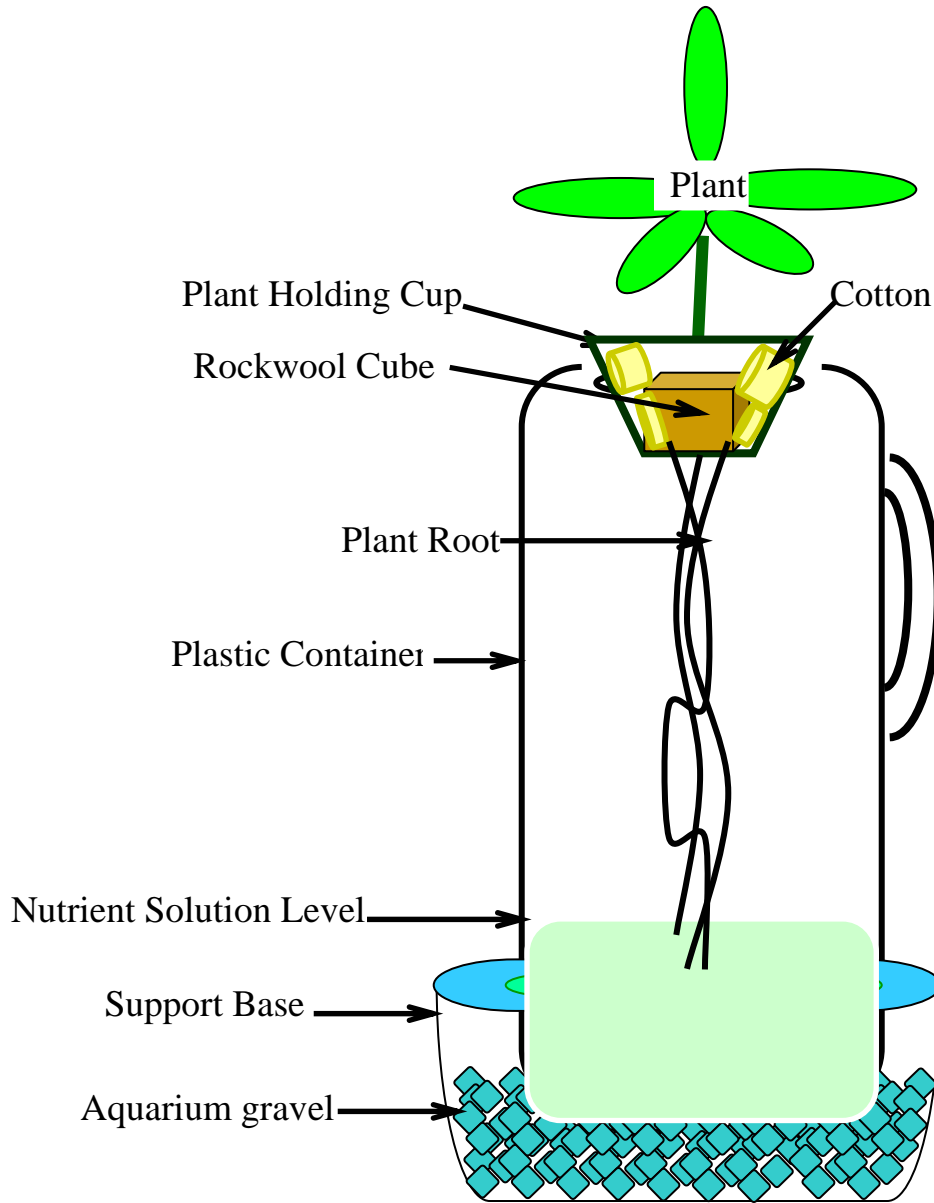


From Plant to Study- Illustration of the Plant and Holder on the First Day of the Study



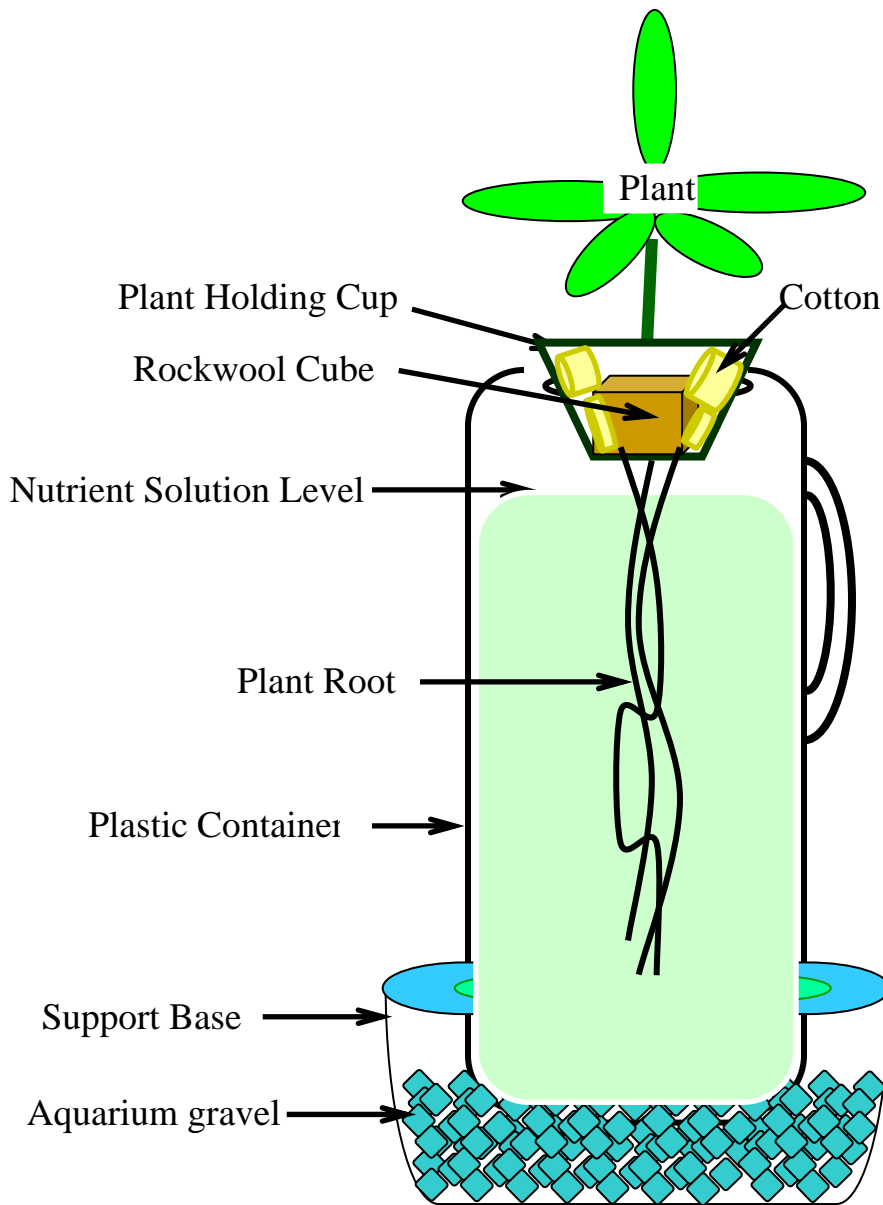
**From Plant to the Study-Illustration of the Plant and Holder
Immediately before Refill**

Sketch of Plant Container Prior to Refill



During the Study- Illustration of the Plant Growing Unit Immediately After Refill

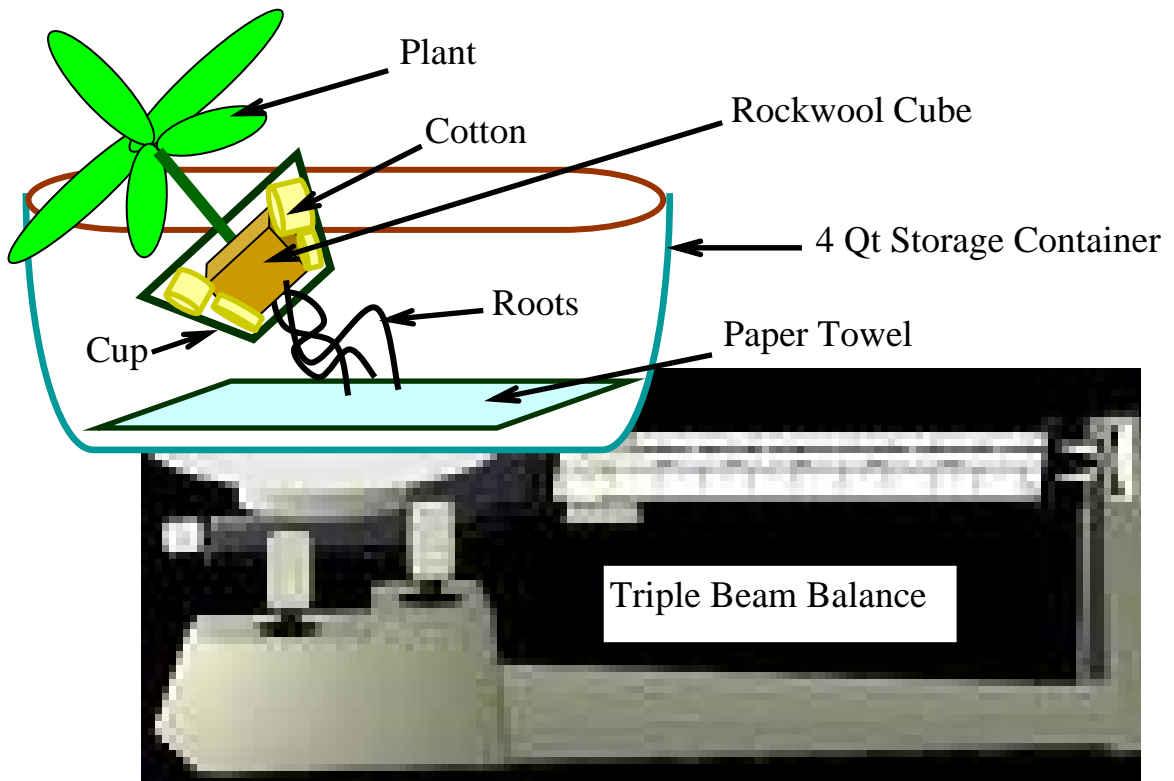
Sketch of Plant Container Following Refill



During the Study- Illustration of Measuring Plant Mass

| Materials for Measuring Plant Mass | |
|------------------------------------|--------------------------------------|
| Triple Beam or Electronic Balance | Minimum limit of at least 500 grams. |
| | Pan must hold the Plant Mass Holder |
| Weighing Container | 4 Quart Storage Container |
| Paper towel | Any brand |

Sketch of Materials Used to Weigh (Mass) the Plants



Measurement Data Tables for Finding the Best All-Around Plant

One-Time Data Entry

| Start Date | Start Nutrient Solution Level (cm) | Final Plant Mass (g) |
|-------------------|---|-----------------------------|
| | | |

| Measure Date | Nutrient Solution Level (cm) | Container Refill (Yes/No) | Weighing Container Mass (g) | Plant Mass (g) |
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Measurement Data Tables for Finding the Best Drought Resistant Plant

One-Time Data Entry

| Starting Nutrient Solution Level (cm) | Final Plant Mass (g) |
|--|-----------------------------|
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Data Recorded on Each Measurement Day

| Nutrient Solution Level (cm) | Container Refill (Yes/No) | Weighing Container Mass (g) | Plant Mass (g) |
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Measurement Data Tables for Finding the Best Growing Plant

One-Time Data Entry

| Start Date | Final Plant Mass (g) |
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Data Recorded on Each Measurement Day

| Measure Date | Weigh Container Mass (g) | Plant Mass (g) |
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Measurement Data Table- All Variables

| Data Recorded One Time Only | | | |
|---|-------------------------------------|-------------------------------------|-----------------------------|
| Container Calibration Ratio (cm/mL) | | Nutrient Solution Refill Level (cm) | |
| Nutrient Solution Starting Level (cm) | | Edible Plant Mass Final Day | |
| Data Recorded on Every Measurement Day | | | |
| Measurement Date | Nutrient Solution Level (cm) | Refill Yes/No | Total Plant Mass (g) |
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Linear Scatter Plot Data Tables for Finding the Best Drought Resistant Plant

5-Measurements

| Plant Mass (g) | N. S. Used (L) |
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6-Measurements

| Plant Mass (g) | N. S. Used (L) |
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7-Measurements

| Plant Mass (g) | N. S. Used (L) |
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8-Measurements

| Plant Mass (g) | N. S. Used (L) |
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9-Measurements

| Plant Mass (g) | N. S. Used (L) |
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Linear Scatter Plot Data Tables for Finding the Best Growing Plant

5-Measurements

| Plant Mass (g) | Time (Days) |
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6-Measurements

| Plant Mass (g) | Time (Days) |
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7-Measurements

| Plant Mass (g) | Time (Days) |
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8-Measurements

| Plant Mass (g) | Time (Days) |
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9-Measurements

| Plant Mass (g) | Time (Days) |
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Study Summary Bar Graph Tables for Finding the Best Drought Resistant Plant

3-Plant Study

| <u>Mass (g)</u> N.S Used (L) |
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4-Plant Study

| <u>Mass (g)</u> N.S Used (L) |
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5-Plant Study

| <u>Mass (g)</u> N.S Used (L) |
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6-Plant Study

| <u>Mass (g)</u> N.S Used (L) |
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9-Plant Study

| <u>Mass (g)</u> N.S Used (L) |
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8-Plant Study

| <u>Mass (g)</u> N.S Used (L) |
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7-Plant Study

| <u>Mass (g)</u> N.S Used (L) |
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Study Summary Bar Graph Tables for Finding the Best Growing Plant

3-Plant Study

| <u>Mass (g)</u> Time (Days) |
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4-Plant Study

| <u>Mass (g)</u> Time (Days) |
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5-Plant Study

| <u>Mass (g)</u> Time (Days) |
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6-Plant Study

| <u>Mass (g)</u> Time (Days) |
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9-Plant Study

| <u>Mass (g)</u> Time (Days) |
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8-Plant Study

| <u>Mass (g)</u> Time (Days) |
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7-Plant Study

| <u>Mass (g)</u> Time (Days) |
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Study Summary Bar Graph Tables for Finding the Best All-Around Plant

3-Plant Study

| <u>Mass</u> x <u>Mass</u> <u>Usage</u> x <u>Time</u> |
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4-Plant Study

| <u>Mass</u> x <u>Mass</u> <u>Usage</u> x <u>Time</u> |
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5-Plant Study

| <u>Mass</u> x <u>Mass</u> <u>Usage</u> x <u>Time</u> |
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6-Plant Study

| <u>Mass</u> x <u>Mass</u> <u>Usage</u> x <u>Time</u> |
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9-Plant Study

| <u>Mass</u> x <u>Mass</u> <u>Usage</u> x <u>Time</u> |
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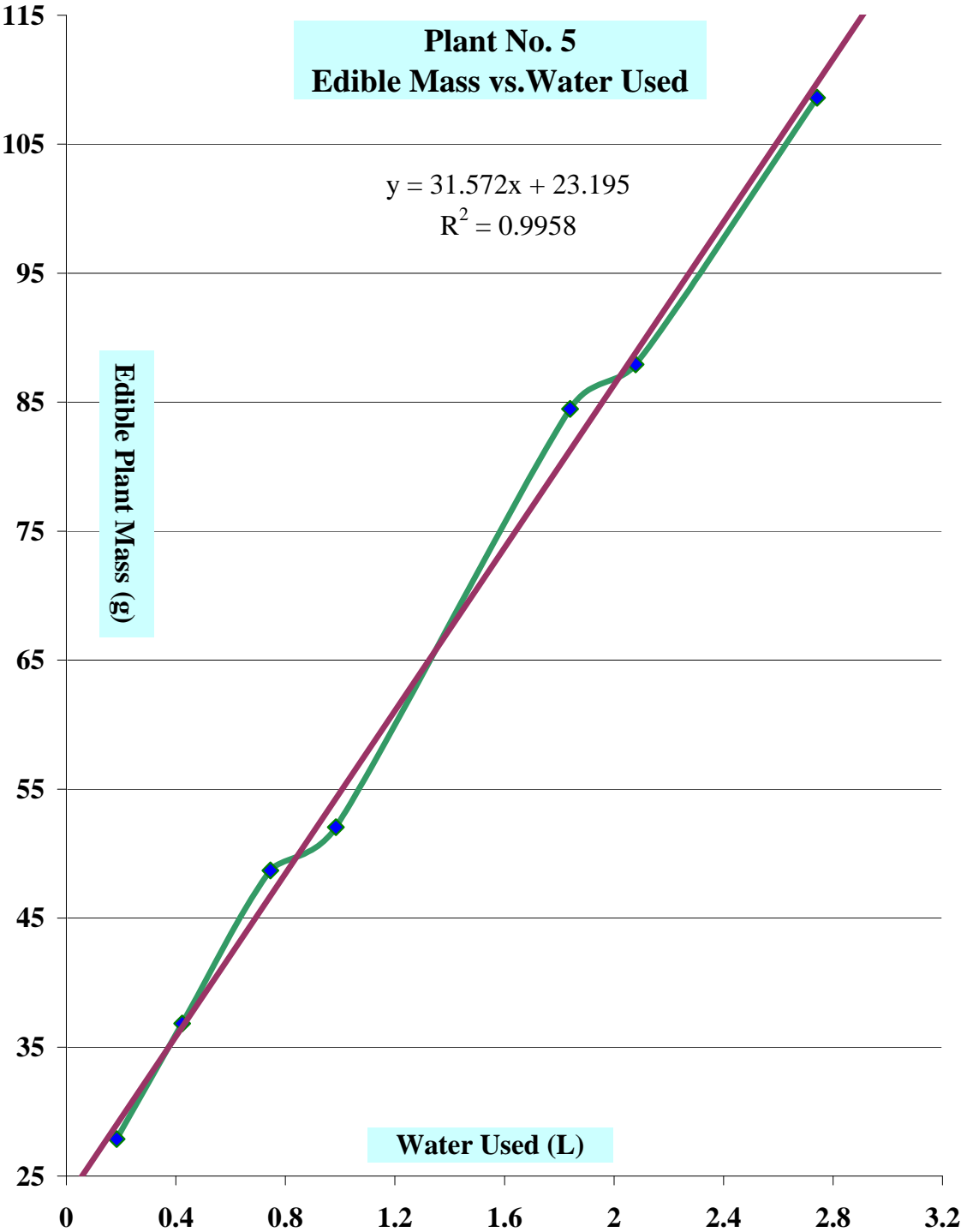
8-Plant Study

| <u>Mass</u> x <u>Mass</u> <u>Usage</u> x <u>Time</u> |
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7-Plant Study

| <u>Mass</u> x <u>Mass</u> <u>Usage</u> x <u>Time</u> |
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Example of a Linear Scatter Plot for Best Drought Resistant Plant



Example Summary Bar Graph for Best Drought Resistant Plant

