

# Learning with Lettuce



**Tower Garden® Lesson Plans that Match  
Academic Standards**



# Compare Growing Lettuce in Three Growing Systems

*Construct and perform fair investigations in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.*

## **Unit Overview**

In this unit, students will compare three growing systems: aeroponics (Tower Garden) hydroponic, (homemade system), and traditional gardening (soil).

### **Vocabulary**

Hydroponic - roots are always in the water.

Aeroponic - roots hang in the air.

Traditional - roots are in the soil.

**Schedule** - Based on 6 weeks from date seeds are planted

**Week Before Planting Seeds** - Make containers, investigate and discuss

**Week 0** - Build the Tower Garden and plant seeds

**Week 1** - Put seedlings into Tower Garden

**Week 2** - Record observations and maintain growing systems

**Week 3** - Record observations and maintain growing systems

**Week 4** - Record observations and maintain growing systems

**Week 5** - Record observations and maintain growing systems

**Week 6** - Draw final conclusions, harvest and enjoy eating the lettuce.

You'll start all of the seeds in rockwool. (See seed starting procedure below) After a week, you'll place some seedlings in the Tower Garden, 1 seedling in the hydroponic system, and 1 seedling in the soil container. If you plant seeds on Monday, by Wednesday they should sprout. The following Monday they should be ready to place in the growing systems.

To keep the light the same, place the soil and hydroponic system on the Tower Garden. Water the hydroponic system with water from the Tower Garden. Water the soil system with water from the tap. (The nutrients in the Tower Garden are drawn from the soil. The soil already has nutrients in it and doesn't need the nutrients from the Tower Garden.)

If you need supplies and don't have a distributor you can order rockwool, mineral blend, and more from my website at [skoontz.towergarden.com](http://skoontz.towergarden.com). If you need help or a new Tower Garden, email me at [steve@tgardener.com](mailto:steve@tgardener.com). I've been supporting teachers who use Tower Gardens since 2015.

## **Set Up**

### **Supplies needed:**

- Tower Garden
- Seeds - black seeded simpson, pak choi, and arugula work well and are easy to find locally. These seeds should sprout in a few days and be ready to harvest in 6 weeks. Choose one variety to grow to keep the experiment consistent.
- 2 plastic Cool Whip containers
- 1 plastic tray (The bottom of a 1 gallon ice-cream container works well for this.)
- 1 Wood Skewer
- Straws to aerate water
- Potting soil (Do not use dirt from the outside)
- 1 sponge

## Directions for making soil and hydroponic containers.

### Make soil container

- 1) Cut 1 hole in the bottom of the Cool Whip container close to the middle
- 2) Cut the sponge in half and place the sponge over the hole
- 3) Fill with potting soil.
- 4) Place container on the plastic tray that will hold about ½ inch of water.
- 5) Water the soil with tap water until water flows into the tray.
- 6) When the seedlings have grown for about a week, bury the rockwool into the soil until the top of the rockwool is just covered with soil.
- 7) From now on, pour tap water into the tray to water the plants.



### Make hydroponic containers

- 1) Cut holes, across from each other, in the side of the container as close to the top as you can.
- 2) Poke a skewer through one of the holes, through the rockwool with a seedling growing, and out the other hole. (See picture)
- 3) Use water from the Tower Garden to fill the container so that the bottom of the rockwool is touching the water.
- 4) Use the straw to blow in the water every school day for about 30 seconds to give the roots oxygen.
- 5) Replace the water Tuesdays and Fridays with water from the Tower Garden.



## **Investigation Week (Week prior to planting seeds)**

Define key vocabulary as a class: variable, hydroponic, aeroponic, and soil growing. Investigate the differences between soil, hydroponic, and aeroponic growing. Investigate what a Tower Garden is and how it works. Determine the differences between growing on a Tower Garden and another hydroponic system. Talk about the differences between growing indoors and growing outdoors. Discuss the need to only change one variable in a fair experiment. Set up/plan out experiment as a class. If you have time, build the Tower Garden, soil container, and hydroponic containers as a class.

### **Week 1**

Plant seeds using the seed starting procedure for schools below. Plant seeds in 30 rockwool cubes. That will leave 28 for the Tower Garden, 1 for the hydroponic system and 1 for the soil system. Take care to plant 10 seeds in each rockwool cube.

### **Week 2**

Place seedlings in the Tower Garden, 1 in the hydroponic container, and 1 in the soil container. (Do not remove the seedlings from the rockwool. They'll grow fine placed in the soil.) Put the hydroponic and soil containers on the base of the Tower Garden as close to the lights as possible.

Add about 2 gallons of water to the Tower Garden. (Bring the level up to about 3 inches from the top). Balance the pH, and add 50 ml of Tower Tonic A and 50 ml of Tower Tonic B.

### **Week 3**

Begin investigation by recording observations to determine differences between lettuce in growing systems.

Add about 2 gallons of water to the Tower Garden, (Bring the level up to about 3 inches from the top). balance the pH, and add 50 ml of Tower Tonic A and 50 ml of Tower Tonic B.

### **Week 4**

Continue investigation by recording observations to determine differences between lettuce in growing systems.

Add about 2 gallons of water to the Tower Garden, (Bring the level up to about 3 inches from the top). balance the pH, and add 50 ml of Tower Tonic A and 50 ml of Tower Tonic B

### **Week 5**

Continue investigation by recording observations to determine differences between lettuce in growing systems. The lettuce should be big enough to pull off a few leaves and see if there is any difference in the taste.

Add about 2 gallons of water to the Tower Garden, (Bring the level up to about 3 inches from the top). balance the pH, and add 50 ml of Tower Tonic A and 50 ml of Tower Tonic B

### **Week 6**

Continue to record observations.

Add about 2 gallons of water to the Tower Garden, (Bring the level up to about 3 inches from the top). balance the pH, and add 50 ml of Tower Tonic A and 50 ml of Tower Tonic B

### **Week 7**

Identify any differences in quality, size, etc. of lettuce and determine which is the best growing system. Invite friends and family to your classroom for a salad party.

# Seed Starting Procedure

This seed starting procedure has been adapted for the classroom from a procedure shared by Joe of level2concepts.com. It's a little different than what's in the Tower Garden manual, but works well in a classroom. This procedure works best growing basil, arugula, red salad bowl, buttercrunch, pak choi, and black seeded simpson. For the full procedure to use with other crops, visit [www.tgardener.com/seedstarting](http://www.tgardener.com/seedstarting).

- Make up a 32 oz bottle of pH adjusted water. (Do NOT use softened water) The pH should be between 5.5 and 6.5. Use the pH test kit that comes with the Tower Garden. Put 5 ml of water in the vile and add 5 drops of the solution. Compare the color with the colored dots on the test paper. Use just 10 ml of the pH - or pH + at a time to adjust the pH. See the directions on the pH test kit to test the water.
- Soak rockwool cubes in the pH adjusted water for 30 minutes.
- Shake excess water from the rockwool cubes. (Don't squeeze)
- Place rockwool cubes into the tray that came with the Tower Garden. If you want to keep track of which student plants what seeds, use empty butter (or similar) containers.
- Drop 6-10 seeds into the hole. (It's OK if some seeds land on top.)
- Pour about ¼" of pH adjusted water into the bottom of the empty container. (You'll probably need to mix up more pH adjusted water.)
- Cover container with construction paper and place in the warmest place in the room.
- Check next day for sprouts and replace water in the container with pH adjusted water.



- After just a couple of days, you should see white 'fuzz' around the seeds. The white fuzz means they've sprouted. (See picture above.) Uncover the container and place it on the base of the Tower Garden and turn on the lights. Each day replace water in container with pH adjusted water.
- If you started the seeds on Monday or Tuesday, by the next week, you should be able to place the seedlings in the Tower Garden
- Fill the Tower Garden green tub with water up to 3 inches from the top (about 20 gallons).. For new seedlings, add 200 ml of Tower Tonic 'A' and 200 ml of Tower Tonic 'B'. Balance the pH.