SpaceLite Kit

The SpaceLite (Plant Research Kit) results from years of NASA-funded research at the USU Crop Physiology Laboratory, www.usu.edu/cpl. You and your students will enjoy learning the science of food production with this kit. May the force be with you!

Included in each SpaceLite Kit

- One lamp with a lamp stand
- One LED light bulb
- One timer for the lamp
- One tan-colored pot with an attached water tray

Assembling the lamp stand

Assemble the stand and install the compact fluorescent bulb in the light fixture. Only the base joints that must be rigid to hold the weight of the lamp are glued. All other joints are friction fit, allowing for easy disassembly and storage of the stand. The fully assembled stand is a little less than 3 feet tall, and the stand and the pot require a space of approximately 2 x 1½ feet.

Where to place the kit

The assembled kit should be located away from drafts that heat or chill the plants. Kits used for comparative experiments should be located close to each other to reduce temperature differences. Placement near a window will provide additional light and improve plant growth, but even in a bright south window, more than 80% of the daily light comes from the lamp.

The light bulb

The included LED bulb provides the high-intensity light necessary for good plant growth. The quality of the light supplied by this bulb is also adequate for germination, flowering, and fruiting of the dwarf crop plants included with the kit. While the quantity of light has the most significant effect on photosynthesis, the quality of light affects germination, flowering, and other plant responses such as the turning of leaves and cessation of growth in the fall.

The timer

Plug the lamp cord into either side of the timer and plug the timer into a wall outlet. Set the timer to the current time and use the tabs around the dial's perimeter to program the timer to provide 16 hours of light per day (e.g., light on from 6 am to 10 pm). We recommend that you maintain the 16-hour photoperiod during every season of the year.

Potting soil
We recommend purchasing a high-quality potting mix for container plants from your local garden store. Most potting mixes are "soilless" and may contain a mixture of peat moss, sawdust, wood chips, perlite, or vermiculite. These materials are more lightweight than actual soil and drain well, which is essential for plant health. Look for a potting mix that already contains fertilizer and will feed plants for a few months. If your potting mix does not have fertilizer, you must purchase a granular, slow-release, or mix-with-water fertilizer and follow the application directions on the label.

Planting
Before planting, fill your pot with potting soil and water the soil thoroughly. Large seeds such as peas should be planted about 1/2 inch deep, but tomatoes should only be planted 1/4 inch deep, and tiny seeds like lettuce should be sown on the surface and lightly covered with additional soil. Seeds that are planted too deep may not germinate. A helpful rule of thumb is to avoid planting a seed more than twice as deep as its longest dimension. After planting, water the soil again lightly.

Plant more seeds than you need, especially if they will be used for an experiment. The extra plants can be thinned, which allows you to select the healthiest plants. Do not allow the surface of the potting soil to dry out during seed germination. Lightly water or mist the soil to keep the surface moist until the green shoots emerge. Turn the lamp on at the time of planting. The lamp warms the soil and provides light as soon as the plants appear.

Adjusting the lamp height
The lamp height above the pot is adjusted by a combined "push-pull" manipulation of the power cord. To lower the lamp, feed the cord into the base of the lampstand while gently pulling the cord at the point where it emerges from the stand above the lamp. The friction on the cord holds the lamp at a constant height. Keep the lamp 4 to 8 inches above the plants. You will need to raise the lamp every few days when the young plants are growing rapidly.

Watering
Proper watering is essential. It is not necessary to keep water in the reservoir at the bottom of the pot, but the surface of the media should stay slightly damp. The daily water use can vary from as little as 1/4 cup to 2 cups or more depending on plant size, light level, temperature, and air movement. Use cool tap water for all watering because it contains calcium, iron, and magnesium, which are beneficial for plant growth. Never use soft water for plants because the nutrients have been removed and replaced with sodium, which reduces plant growth.

We recommend that water be added to the top surface and not to the bottom tray. This prevents nutrients (fertilizer) from accumulating at the top of the pot as water evaporates from the surface of the potting soil. Nutrients washed into the tray at the bottom will be reabsorbed when the water is drawn back in as the soil dries.

Add water in measured amounts, about two cups at a time. Allow about 10 minutes before adding the following two cups. Continue this until water shows in the tray at the pot's base. Incremental additions of water will help prevent an overflow of the tray and allow tracking of water use by the plants. Small, young plants only need a small amount of water every few days, but when the plants are full size, they can use cups of water per day, depending on the humidity and temperature. A soilless mix in the provided pot can hold over a gallon of water that is available to the plants. It may be possible to go a week without adding additional water. At the end of the week, you would then need to slowly add back over a gallon of water to replace what was used in transpiration.

Procedure for Germinating Small Seeds

Cody Tramp and Bruce Bugbee

Small seeds, like MicroTina Tomato and Triton Pepper, benefit from germination in a container.*

1. Take a plastic container with a lid and fold layers of brown paper towel in the bottom until the stack is about 0.5 to 1.0 cm (1/4 to 1/2 inch) thick. Brown paper towels make it easier to see the white emerging roots.
2. Add cool tap water to the container until the paper towels are thoroughly soaked. Do not use soft water. It contains sodium, which is harmful to the germinating seeds.
3. Pour off excess water. When tilted onto a corner, there should be about 15 mL (1 tablespoon) of water in the corner. The seeds must be above the water level.
4. Place the seeds on top of the paper towels, about 1 cm (1/2 inch) apart.
5. Put the lid on the container to keep the paper towels from drying out and to provide a humid environment. It is not necessary to put holes in the lid. Opening the container every few days will provide enough oxygen for seed respiration.
6. Keep the container at room temperature and away from heating or cooling units, as percent germination can be decreased if the temperature is above 30 °C (86 °F).
7. Do not leave the seeds by a window or other source of bright or direct light. Classroom light levels are fine for germination. Seeds do not need to be in the dark.
8. Check the container daily to see if the paper towels are drying out. Maintain water level so there is about 15 mL (1 tablespoon) of water in a corner.
9. Check the container daily for any seeds covered in mold. These seeds are dead. A living seed can protect itself against mold growth. Remove dead seeds from the container.
10. When the root, called the “radicle”, appears, carefully transplant the seed to a pot. Pick the seeds up by the seed coat, and not by the radical, which is easily damaged.
11. Seeds should germinate in 4 to 7 days.

*Larger seeds (wheat, soybean, and pea) can be planted directly into pots.

Container with paper towels and seeds

Germinating seeds with emerging roots. The fuzzy appearance is caused by healthy root hairs and is not mold. Seven seeds are ready to transplant. The remaining eight are not ready yet.

The two seeds on the left are healthy. On the right, the top seed is covered in a white mold, and the bottom seed is covered in a black mold. Both are dead and should be discarded.

Optional plant light extender.