

# Seed Starting

## A Visual Primer

As the title expresses, this article is about seed starting the way we do it.

The seeds used are all seed that was collected and stored by us and comprises four varieties, corn, sweet pepper, cucumber and pumpkin.

These seeds were in frozen storage. I removed them

from the freezer and placed in a refrigerator for about a week. At that point I brought them to the starting tray and started recording their images for posterity.

Each day I photo recorded their progress.

Hopefully you find this interesting.

### Starting Tray



Image 1

This is one of my seed starting trays. Visible in the bottom is a home made rope light seed starting mat. It is approximately 14 inches wide by 46 inches long.

In the bottom of the plastic tray is a folded washcloth and two layers of paper towels. Both are moistened.



Image 3

This image shows the seeds covered by another two layers of paper towels.



Image 2

Day 0, left to right corn, pepper, cucumber and pumpkin seeds.



Image 4

And in this image there is a second folded washcloth on top of everything. There is a sheet of plastic wrap over the whole tray. It retains moisture and turns the tray into a mini greenhouse.



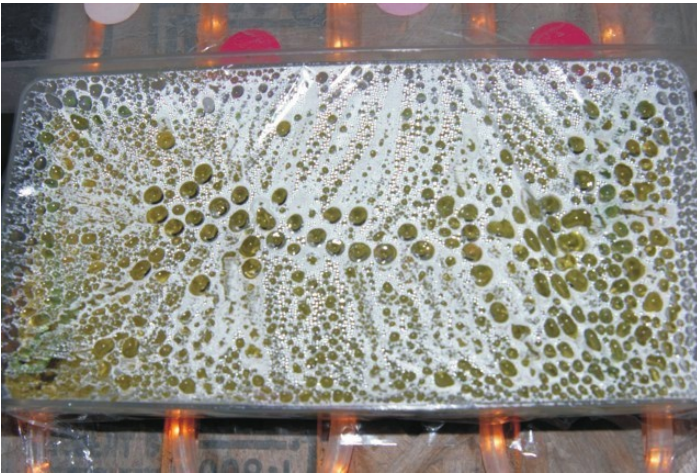


Image 5

Day 1 In this image we can see condensation on the bottom of the plastic wrap. This tells us our heat mat is working.



Image 6

Day 1 I have introduced a small screw to act as a focal point when repositioning the camera. The seeds are starting to swell and if you look closely you can see that one of the cucumber seeds (the top one) has germinated and is starting to extend a root (close ups of the seeds are further in this article).

Seeds have what is called gravitropism. Without getting super technical (unless you want me to) this means they know which way is up when they sprout.

When you direct sow seed you don't need to worry about placing them with the right side up because they can figure it out on their own.

When starting seeds, especially sprouted seed, you need to keep this in mind and make sure you plant them in the correct orientation. Otherwise you may have problems with the plant starting to grow in the wrong direction and the problems can range from sprouting delay to sprout failure.



Image 7

Day 2 Here we can see a lot of progress. All the corn seed has germinated and started to sprout. We can see the top cucumber is making headway and if you look on the upper paper towels you can see that two of the pumpkin seeds have germinated and are sending out a root.

I will be taking one of each of the starts and putting them in a transplant tube so we can monitor their progress.

In one of my previous articles I mentioned I could go from dried corn seed to sprouts in about two or three days, well here's the proof of that.

It we were starting seed for real the corn, cucumber and pumpkin seed is ready to be direct sown or put in transplant tubes. If you wait any longer you will start having problems. For one the sprouts are using up their stored energy to grow. They will aggressively send out roots looking for soil to root in. This is a waste of their stored energy. Another problem is the longer the roots get the more fragile they become and the more likely you are to break them while trying to plant them.



Image 8

Day 3 The lighting is different because I had to use a strobe to take pictures and I didn't take the time to change my camera setting or do post on the images.

(continued on next page)

(referencing image 8, previous page) In this image we can see a lot of progress on all the seeds except the peppers. According to my germination charts I can expect them to take as much as ten days to germinate.

I have removed a corn, cucumber and pumpkin seed to place in transplant tubes. There will be a series of images on that later on in this article.

In a previous article I mentioned how starting seed like this could really get away from you. As you can see the corn and pumpkins are well past when they should have been planted or potted.



Image 9

Day 4 This image is crappy because I was exhausted when I took it and didn't bother to fix my mistakes. I would have retaken the image except I already threw out all the seed here except for the peppers.

As we can see things have really gotten out of hand in only one day. The corn and pumpkin seed is completely out of control and the sprouts are consuming a lot of their stored energy looking for something to root in.

You could still plant this seed but you would have to be very careful to avoid damaging the roots. If you look closely you can see the corn seed roots (towards the center) have started to grow through the paper towels.

I'll continue to monitor this tray for progress with the pepper seeds but if they haven't sprouted by the time I send this off to Wirecutter I'll just let them go.

The next sections will be close ups of the individual seeds and a series of images on making transplant tubes.

## Corn



Image 10 Day 0



Image 11 Day 1



Image 12 Day 2



Image 13 Day 3

Corn - In this sequence of images we see a kernel of corn from day 0 to day 3. Day 0 corn has a hard, dry appearance. The day 1 image reveals changes in texture to the pericarp (the outer layer of the seed coat) and the testa (inner layer of seed coat). The seed is also beginning to swell as it absorbs moisture.

Also note changes in the plumule (what turns into the new plant) and the radicle (what turns into the new root) as they respond to the presence of heat and moisture.

In the day 2 image both the plumule and radicle have greatly advanced. This sprout could (and should) be planted by this point. Actually this one was put into a transplant tube and the day 3 image is of a different kernel, which kind of breaks the time line a little but nothing that we can't deal with.

If you refer back to Image 9, which is day 4 of the tray (and day 4 of the corn sprouts) you can see how far gone the corn sprouts are by this point.



## Cucumber



Image 14 Day 0



Image 15 Day 1



Image 16 Day 2

These images reveal how fast cucumbers can germinate given proper conditions.

Take note of the damaged seed on the left in image 14. This seed will not germinate. When you are starting from seed you want to discard all marginal seed.

Either day 1 or day 2 seed could have been planted or potted. We will follow this seed, day 3 and on in the potted series further in this article.

## Sweet Pepper



Image 17 Day 0



Image 18 Day 1

As with the other seeds compare the pepper seed after only one day with its dry state. Changes in the testa are apparent and its appearance has become almost transparent.

The milky white structure you can see in the seed is the embryo. The area on the bottom right of the seed in image 18 is where the radicle will protrude.

Not much will change in the appearance of this seed

until the radicle erupts. It hadn't by the time I was sending this to be shared so we'll miss out on seeing the peppers germinate and sprout.

Hold the presses, one of the pepper seeds decided to sprout on day 6. Here is a picture of it



Image 19 Day 6

## Pumpkin



Image 20 Day 0



Image 21 Day 1



Image 22 Day 2



Image 23 Day 3

The day 0 image of the pumpkin seed reveals a fully dormant seed.

By day 1 notice the softening of the testa near the micropylar endosperm (where the radicle will protrude).

On day 2 the radicle has emerged and we have a fully viable germinated seed. We could plant this sprout at this point.

By day 3 things are getting wild and if you refer back page 3 image 9, which is day 4, you can see how fast everything can get completely out of control.



## Transplant Tubes

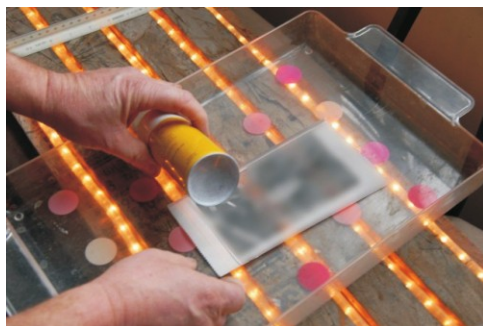


Image 24



Image 25

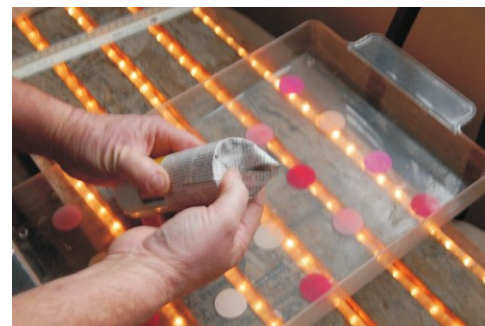


Image 26

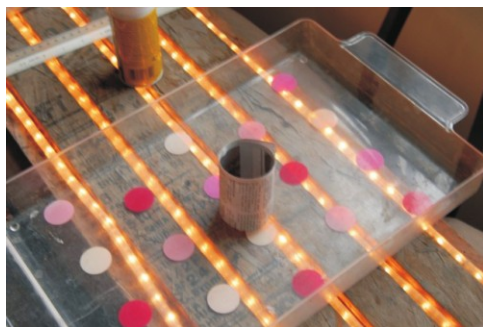


Image 27

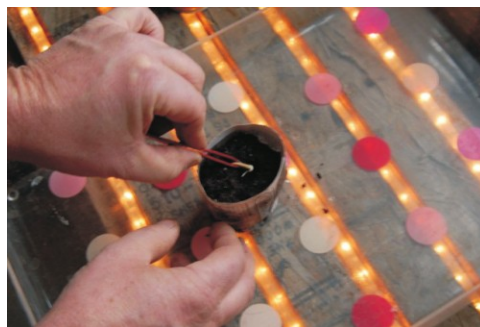


Image 28



Image 29

These six images show the sequence of steps for making your own transplant tubes out of newspaper. They are pretty self explanatory so I won't go into a lot of detail. Note the diameter of the spray can I'm using is right at two inches. Also if you look close you'll see that the bottom of the can is slightly recessed. This helps in making a bottom crimp but is not a requirement. Also, in image 28 you can see me planting a sprouted cucumber seed.

## Sprouts in Transplant Tubes



Image 30 Day 2



Image 31 Day 3

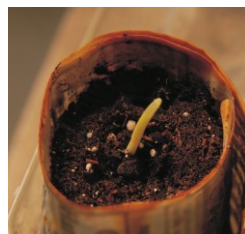


Image 32 Day 4



Image 33 Day 4

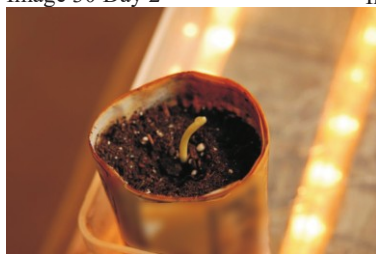


Image 34 Day 5



Image 35 Day 5



Image 36 Day 6



Image 37 Day 6

Here in image 30 (day 2) we can see three transplant tubes, left to right corn, cucumber and pumpkin. These are the seeds I pulled out of the tray on day 2. Image 31 is corn day 3, with a visible sprout. Image 32 is corn day 4. Image 33 is the hook of the cucumber just starting to show. That's what the small white circle is around. Image 34 is our corn sprout at day 5. Notice how the sprout is bending towards the light coming through the window. Seeds started indoors using natural light can become leggy as they grow to reach the light. Image 35 is our cucumber on day 5. You can see the cotyledon leaves starting to emerge from the seed pod. Images 36 and 37 are our corn and cucumber on day 6. Turning the corn tube half way around has straightened up the sprout.

It is important to not lose sight of watering your new starts. The combination of them aggressively growing, the heat from the pad and the wicking effect of the newspaper tubes can dry your seedlings out to the point of failure very quickly.



Image 38 Corn Day 7



Image 39 Corn Day 8



Image 40 Cucumber Day 7



Image 41 Cucumber Day 8



Image 42 Pumpkin Day 8

This is the final look at our seedlings and concludes the seed starting demo.

In images 38 and 39 we can see the leaves of the corn growing up inside and then growing through the coleoptile. The coleoptile is the exterior covering of the shoot of monocots.

In images 40 and 41 our cucumber (which is a dicot by the way) on days 7 and 8 is demonstrating the ill effects of low lighting. The seedling is becoming very leggy. If your seedlings look like this you need to take some corrective action, namely getting them some more light. We use fluorescent lights (classed as grow lights) if we need to augment the natural light when we are starting seed. Remember seedlings will grow to reach the light so you want to place them as close as possible to your plants.

Even though we are using fluorescent tubes rated as grow lights, somewhere in my notes are the results of a study done by a fellow (I think) on the effectiveness of different types of fluorescent light bulbs for growing plants. His results were surprising in that he found a brand of commercial tube that was as, or more, effective than grow lights. If I can find it I'll post it for you.

In image 42 our pumpkin (another dicot) is finally making a showing. It was actually out of the ground on day 7 but I didn't get a pic for some reason. I have to tell you, have some pots, of ever increasing size, around if you are going to start your pumpkins this way early in the season. Pumpkins have a tendency to grow fast and they are not very frost tolerant. If you start them too early and set them out early without protection, your early starting efforts could be for naught as they get frost burned to the ground. Yes, I experience this every year as I try to push the beginning of the growing season ever earlier.

A little blurb about dicot plants. The two leaves you see are what are known as cotyledon leaves. Eventually the plant will develop its first true leaves. The cotyledon leaves generally will turn yellow and fall off the plant so don't be alarmed if you come out to your starts you've worked so hard to grow and you find a couple of yellow or dropped leaves.

Now to avoid having you go the other way, if you are getting lots of yellowing and/or dropped leaves you have something going on and you need to figure out what it is and correct it before you lose all your plants. The causes can range from environmental, too much water, too little water, too cold, too hot (hmm, it's starting to sound like Goldilocks and the bears pudding, you need conditions to be just right) to too much fertilizer and disease.

Water, I generally let my seedlings start to dry out a little before I water them. Too much water can facilitate damping off disease. This is one of the reasons we bake our starting mix for up to a few hours before we use it.

Fertilizer, I never fertilize new seedlings. Using a well balanced compost I generally don't fertilize my plants until they are putting on blossoms, if at all. When I do fertilize I either use a home grown liquid fertilizer made by perking water through compost and chicken manure or I use Alaska Fish Fertilizer.

I guess that's it for this article ~ foodgrower