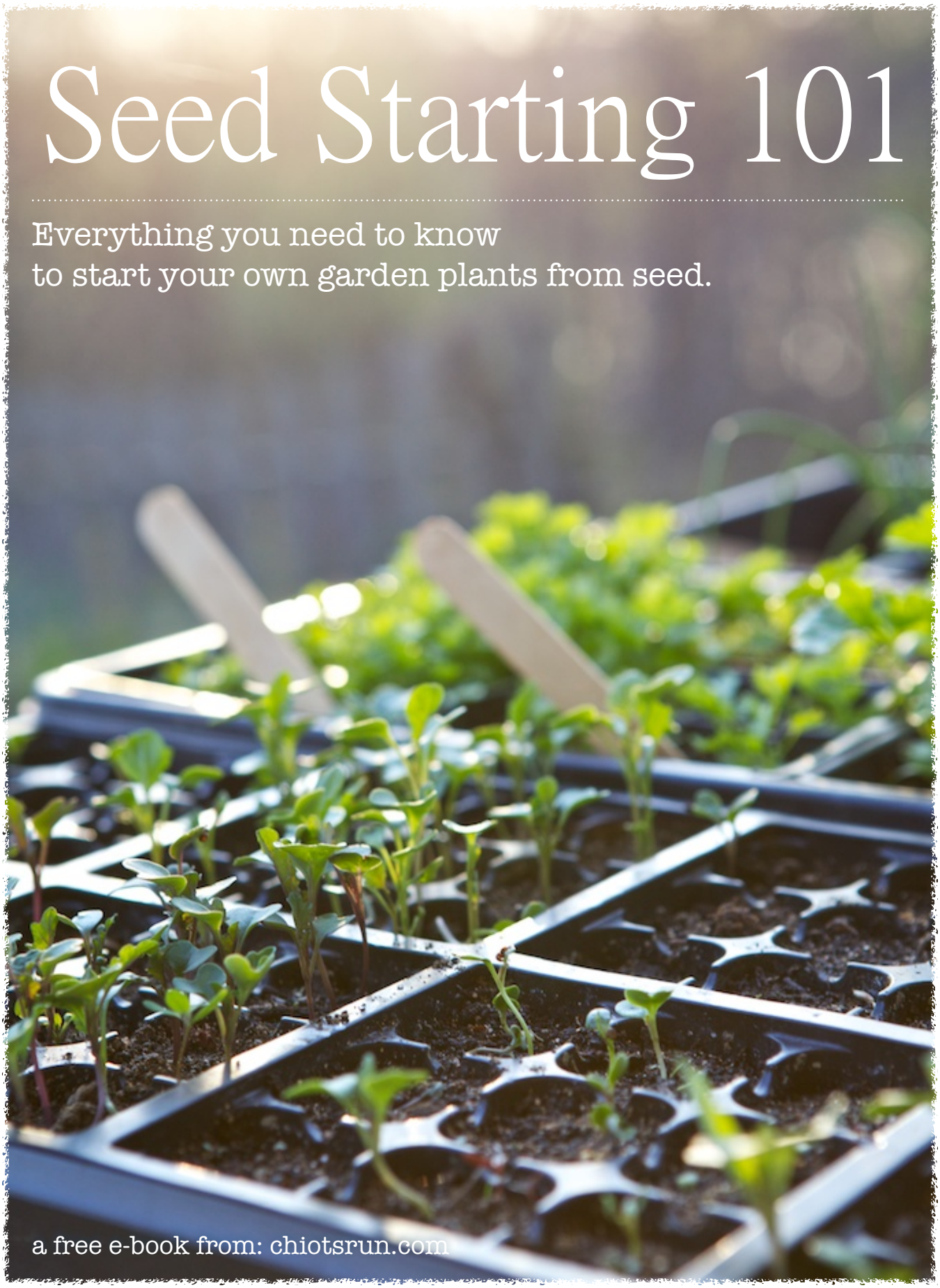
# Seed Starting 101

Everything you need to know
to start your own garden plants from seed.



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# Why Start from Seed?

*Starting plants from seed is a great way for us gardeners to take our hobby to the next level. Perhaps you've been gardening for a long time and have never taken the plunge into the world of seed starting. If you have never started a plant from seed, you're missing out on one of the most amazing experiences as a gardener. There's something incredibly satisfying about seeing a plant blooming in the garden or harvesting a vegetable that you held as a seed in your hand.*

Your local greenhouse is often limited in the varieties that they carry, this is not the case with seeds. There are a variety of plants you can get that you can't find at your local nursery. Seed catalogs offer an almost dizzying selection of just about anything you'll ever want to grow, from herbs and vegetables to tropical plants and vines. There are so many seed companies out there that offer so many wonderful things, you'll never get bored and have to grow the same thing over and over again (unless you want to that is).

Starting your own plants from seed, allows you to also know exactly how that little seedling has been treated. If you're an organic grower and strive to have a chemical free garden, then you pretty much have to start from seed (unless you're really lucky and have an organic greenhouse in your area). My local greenhouse offers a great variety of interesting plants, including heirloom vegetables, but I know they're not organic and those little plants are covered with chemical fertilizers and pesticides. This gets



them off to a bad start, I believe it makes them more susceptible to disease and pest issues later on. The seedlings you start at home are much stronger because they have been treated with love and care they deserve.

Growing garden plants from seed allows you to learn more about plants and how they grow. It's also a fabulous learning experience for any little ones. I have fond memories of watching beans germinate and grow into giant plants.

There are so many reasons to start your plants from seed. I love growing interesting plants, especially vegetables, this is why I start most of my plants from seed. I also strive to achieve a completely organic garden so I don't like buying plants from the nursery, especially when it comes to food plants. Saving money is a nice bonus that can't be overlooked, it would cost me a fortune to buy all the plants I like to grow, especially annuals.

There will be a guide at the end of this book with links to a variety of products and seed sources that I like using. Some are also included in the text.

## Getting Started

Making the decision to start plants from seeds instead of buying them at the nursery can be a scary endeavor for a first timer. The catalogs are shiny and colorful, promising all kinds of bounty and beauty from a packet of seeds. But, the terms are often foreign: stratification, open pollinated, heirloom, OG, hybrid, F1, F2, heating mats, air pruning, soil less mix, soil blocks, etc. How does one get started down the road to seed starting success without spending a fortune and ending up with withered, leggy or dead seedlings?

First of all, I'd recommend: START SLOWLY. Begin with one or two flats of seedlings, the investment in time and money will be minimal. You will quickly find out whether or not you want to someday have 15 to 20 flats to monitor on a daily basis. Starting seeds takes a lot of daily attention if there are a lot of them. Don't forget, you have to plant all those seedlings when the time is right (which is usually when you don't have the time to do it).

Grow a few things from seed that are easy and fairly hardy, almost fool proof. If you like vegetables, try tomato, pepper or zucchini. If you like herbs, try basil, oregano, or cilantro. If you like flowers, try petunias, snapdragons or zinnias. Some seeds can be difficult to get to germinate or to nurture from seedling to plant (like rosemary and hollyhock). Once you have had a lot of success with the easy seeds, move on to more challenging varieties.

You must also temper your excitement and: DON'T START SEEDS TOO EARLY. You want to time your seedlings so that you can plant them outside when they're big enough to survive, but not too big as to be too shocked from the transplant. You also don't want your seedlings to be too root bound in their containers because they will take longer to set roots into the soil in the garden. Larger plants also take longer to bounce back after being transplanted.

The third thing I'd recommend: READ, LEARN, ASK, READ AND LEARN SOME MORE. Read blogs, books, articles, magazines and anything you can get your hands on. Ask friends, neighbors, or family members, who you know start seeds if they will teach you. Search for local seed starting workshops in your area; often greenhouses, libraries, community centers, and farmer's markets will offer free classes on gardening. I know of 3 different places in my area that offer a wide range of workshops for the new gardener on a variety of topics, seed starting being one of the most the popular classes.

Sometimes it's easiest to learn if someone shows you. At times it can be difficult for an experienced gardener to tell you exactly what they do because they can forget things they do out of habit. If you're watching them, you can pick up on those subtle things they do.

The fourth thing I'd recommend is: DON'T BUY TOO MUCH STUFF. You really don't need much for seed starting, especially in the beginning. All you really "need" is soil (or starting medium), a container, seeds and a good light source, that's pretty much it. Don't be wooed by all the fancy expensive seed starting items and light tables in catalogs and on-line. Plants have been starting themselves for years outside without our help, they certainly don't need all the bells and whistles that some gardening catalogs would have you believe. When I first started, I used a few old yogurt cups, some home mixed potting soil, and a few packs of cheap seeds. Talk to a few fellow gardeners, you may find someone that is willing to give you some advice, share seeds, or even loan you a grow light for your first seed starting efforts.





You also want to: MAKE SURE YOU HAVE THE TIME. Seed starting is fun, it's amazing to watch the seeds germinate then grow into tiny seedlings, then grow into beautiful plants in the garden and produce beautiful flowers or delicious vegetables. It's definitely something that I enjoy doing, but it does take time and effort. If you're a busy person and don't have time to babysit little seedlings you're better off buying a few from your local greenhouse each year instead of starting your own. You don't want to end up with trays of dead seedlings and feeling bad about it, that's no fun. Perhaps you can find a fellow gardener that has the time and you can work out an agreement, you buy all the seeds and supplies and they grow the seedlings.

You always want to: LABEL WHAT YOU PLANTED. No matter how much you think you're going to remember you won't. It's so easy to forget which variety is which. When it comes to plant tags, make sure to use something that won't wash off - permanent marker is not a good option in the garden, it fades in the sun. I recommend using a grease pencil on a big popsicle stick. It's also valuable to write the sowing date on the back because you might forget that information as well.

And finally: DON'T BE DISCOURAGED IF YOU DON'T SUCCEED AT FIRST. Some seeds are difficult to start, there are diseases that can wipe out seedlings, perhaps you got a bad pack of seeds and sometimes it's not the right time to start a certain plant. We've all had failures, the key is to try again. One year I couldn't start a chamomile seed, not even one. Most years I end up with more chamomile seedlings than I need.

If you find you don't have the time or patience to start plants from seed, there's nothing wrong with buying plants from a good local nursery. For the small home gardener, it's often much easier to buy already established seedlings. I would recommend not buying from the big box type places, search out a small local place. They'll be able to give you better advice and information on what you need, what works in your area and tips to successfully grow what you purchase.

## Containers

Containers are a very important part of the seed starting system. There are many different kinds of containers. You can use anything from: plastic, terra-cotta, pressed peat, newspaper pots, wood, toilet paper tubes, egg cartons, egg shells, soil blocks, and so much more. I've used just about every single option in my seed starting career, and continue to try new methods each year.

A long, long time ago, when I first decided to start some seeds I attempted to make newspaper pots and used some toilet paper tubes as well. They are cheap, but with the amount of seeds I start I just don't have time to make the hundreds of pots I need. There are many people that use them for everything and love them, but they're not for me. The next year I bought one of those Jiffy Mini Greenhouses that came with those little Jiffy Peat Pellets. I do like the little peat pellets, they're very nice, quick and easy, but they can be pricey! Especially if you're starting 500 seeds or more each spring. I have also found that home mixed seed starting mix gets my seedlings off to a healthier start than the peat pellets. But, if you're pressed for time, these would be a pretty good option.

After that, I tried using flats with small cells that my mom gave me and I bought a few more at the local greenhouse. They cost about .99-$1.50 for each piece and can be used for several years. This is the method I still use and love. I like that you have the option of different cell sizes. I prefer to use the smallest ones because they maximize the space under my grow lights, which is limited during the seed starting season. These are also available from Johnny's Selected Seeds. Each year in February they have a seed starting sale offering 10% of their seed starting supplies, this is when I stock up.

Several years ago, I bought some peat pots to try. I have to admit, I am not very fond of them. They dry out much quicker, especially when the seedlings were outside. I found that I had to water them water, several times a day. I didn't think that my seedlings did as well in them as they do in plastic pots.

There are a lot of gardeners that love to use soil blocks for seed starting. You can buy different sizes, the smallest fitting into the next larger one, and on up here's the soil blocker page at Johnny's that shows all the sizes & extras). I have a medium soil block maker and a small one, but I have yet to master the soil mix for them. I also need to invest in some strong trays. Soil blocks are heavier than plastic pots so the black plastic trays aren't really strong enough to support the weight (at least with the soil mix I've used). I definitely am interested in using these much more in the future, especially as I start more and more seedlings.


I really love using terra cotta since it's reusable and my plants seem to thrive in it. But they're expensive to get enough, especially for the amount of plants I have. I do use them for some of my seed starting, especially for things that I want to keep in pots or grow inside as a houseplant.

Of course you can also direct seed in the garden, and then you

don't even have to worry about containers. I try to do this as much as possible since plants, like gardeners, prefer to be in real soil and under the sun, instead of indoors in a plastic pot under lights. It also saves time when you aren't nurturing tiny seedlings indoors. There are no worries of lights either. However, if you're a northern gardener you'll have to start things indoors if you want to eat a ripe tomato before the first frost. Also, some seeds are just easier to start indoors (like onions and seeds that take a long time to germinate). I like to start heat loving plants, like tomatoes, peppers and squash family plants indoors as well. Lettuce, spinach, carrots, peas, and other cool season crops do much better when started directly in the garden.

What about those clear plastic domes that comes with some seed starting kits? They're nice to help keep the soil moist while your seeds are germinating, especially if your house is dry. However, I prefer not to use them as I find they tend to encourage the growth of white mold on the soil surface. Keep a spray bottle around to mist the top of the soil to keep it damp until seedlings emerge.

I'll continue to try new container options just because I like to try new things and it gives me some great fodder for my blog. For the majority of my seed starting I'll continue using regular plastic trays because I have a bunch of them, they're inexpensive, they can be used for a few years, and they're convenient. I'll keep posting at Chiot's Run about anything new and fantastic I find or new methods I try that I like or dislike. For the beginner, use whatever you can find and what works best for you. If you have a source for free plastic pots, use those, if you want to make newspaper pots, do that. Use what you like and what is inexpensive.

## Soil Mix

After choosing your containers, you'll have to decide what kind of soil mix you want to use for your seed starting efforts. There are all kinds of options: store bought soil less mix, home mixed medium, soil blocker mix, coconut coir, and peat pellets. There are all kinds of ideas floating around about what you should use for starting seeds. Some people say you shouldn't use compost in your seed starting mix, others say you should because it's good for the plants. Some people are against peat for environmental

reasons and claim coconut coir is the way to go. Some people prefer the convenience of peat pellets or store bought soil less seed starting mix, some people mix up their own.

Here at Chiot's Run, I like to mix my own and I have since the beginning. With the amount of seedlings I start, I'd spend a fortune on starting medium if I bought it. After trying all kinds of recipes I settled on one that consists of 40% peat moss and 40% medium vermiculite and 20% worm castings (I've tried using coconut coir and haven't been as happy with the results as I am with peat moss). When possible, I like to use compost and leaf mold instead of some of the peat moss in this recipe. There are plenty of sources of good seed starting mix if you don't want to take the time to mix up your own. See if you can find a local source, the mix you will get from them will be much higher quality than something from the big hardware stores. You may ask, why do I use worm castings in my mix? From the Fedco Catalog:

*"Research at Ohio State University indicates that adding 10–20% worm castings by volume to potting mixes greatly improves germination, seedling growth and plant productivity. It is also a case of more not necessarily being better, as greater amounts produced decreased benefit. (See Growing for Market, Sept. '06) The researchers are not sure why, but the worm castings limited plant disease and had definite beneficial effects including enhanced mycorrhizal activity and the suppression of parasitic nematodes. Adam Tomash has been using homegrown castings in his garden for years and anyone who has seen his vegetables can attest to their magnificence. Benefits are lost if castings are sterilized."*

I also like to add some Dr. Earth Organic Starter Fertilizer as well (I follow the directions on the package and mix it in at half strength). Seedlings don't really need fertilizer until they get their first or second set of true leaves (meaning the leaves that look like the adult plant leaves or the second set of leaves to emerge), and you can't fertilize with full-strength fertilizer because you run the risk of burning the seedlings. Always use half the strength indicated on the package when adding fertilizer to seed starting mix or when watering with fish emulsion, seedlings are easily burned from fertilizers.

I've also experimented with watering my seedlings with weak a fish/kelp emulsion every week or two instead of using the fertilizer in the soil mix. It works well and producing good results, but you have to remember to use it every 2 weeks though. If you won't be able to do that, use the starter fertilizer in your seed starting mix. Some people mix their own with 30% peat, 30% vermiculite and 30% compost instead of a fertilizer (you can us perlite instead of vermiculite if you'd like, I don't like perlite so I always use vermiculite). I don't have a ton of compost so I save it and add it to the holes at planting time, (I also use it in my homemade potting soil mix for larger plants). Some people recommend only using sterilized compost or peat to start seeds, personally I would never sterilize my compost, peat, or anything I'm using to grow plants, part of the value of the soil is the microbes it will provide. Think of it like the probiotics in yogurt, they boost your immune system.


The main reason I mix my own seed starting mix is to save money. I buy the peat moss and vermiculite at my local farm supply store (the drive-thru feed type store). It costs me about $25 for 8 cubic feet of final seed starting mix. I like to mix it up in small batches in plastic storage containers. I make sure to mix up a batch in the fall and store it in the basement for late winter seed starting mix.



Whether you mix your own, buy it in a bag, or use peat pellets, your seed starting medium will need to be damp before you can plant your seeds. It's often difficult to get peat to absorb moisture if it's really dry. The vermiculite or perlite helps it absorb moisture and using hot water is also very beneficial the first time you wet the medium. I warm water in my small teakettle and pour it on the dry mix. I keep adding water till the tray feels heavy and the soil is nicely moistened. If I add too much water and there is some collecting in the bottom tray I usually wait an hour then pour out any excess water. I also like to wait a day before adding the seeds to allow some of the moisture to evaporate, too much moisture is the most common seed starting problem and it can lead to disease problems. Then I plant the seeds according to their needs.

## The Needs of Seeds

The most important thing to pay attention to when you're starting seeds is the needs of each type of seed. Not all seeds are created equal. Some need light to germinate, others need darkness. Some seeds need warm soil, others need cool soil. Some seeds need a cold spell before being able to germinate, others need some heat. Some seeds do better if they're scarified, which is the scratching, breaking or softening the tough seed coat. You need to research and figure out the needs of the types of seeds you're trying to start or you will be disappointed with low or no germination.

Plants are like anything else so the #1 rule for seed starting is to: READ INSTRUCTIONS BEFORE PLANTING. There's nothing more frustrating than seeding a tray of alyssum and then remembering that they need light to germinate, and of course you covered them with soil. Most plant packets contain all the information you need, with planting depths, light requirement, stratification, or any other special needs. If you bought heirloom seeds or traded seeds with someone, the internet will provide you with a wealth of information about that specific type of seed. This is the best way to ensure proper germination and a happy gardener!

The second most important thing when it comes to good germination is to: MAKE SURE YOUR SEEDS ARE FRESH. Since seeds are a living thing, although dormant until given the right conditions, they need to be treated with care and they do have a shelf life. Different kinds of seeds have different

shelf lives, some are viable for many years, while others only last for only a year or less. If you save seeds past their normal shelf lives you risk low or no germination. Onions for example are only viable for one year, don't bother trying to start them the second year, you will only be frustrated. If seeds are stored properly their shelf life will be normal and if stored in the fridge or freezer you can save them 2 to 5 years. There is a chart at the end of the book to help you determine the shelf life of seeds.

You'll also need to: DETERMINE IF YOUR SEEDS NEED LIGHT TO GERMINATE. Some seeds need light, others need darkness, and some don't care either way. Hollyhocks need light to germinate, that's why I floated them in water in my kitchen windowsill. It seems that the smaller seeds need light for germination, so they need to be sown on top of the soil. Tomatoes, peppers and other vegetables don't really care, these seeds are covered with soil when planting (1-1.5 times as deep as the seed).

FIND OUT IF YOUR SEEDS NEED WARM OR COOL SOIL. Some seeds need warmth to germinate, like tomatoes and peppers. Others prefer cooler soil, like spinach and lettuce. Often the conditions the seeds prefer are just like the conditions the adult plants like, which is nice because it makes it pretty easy to know. When I'm planting cool vegetables I often sow seeds in the flats and put them on the floor of the basement, which keeps the soil about 55 degrees. This is perfect for lettuce and spinach. If I'm seeding warm soil vegetables, I put the flats on a seedling heat mat or in a warm spot, like the top of the fridge. I'll often put these trays outside on warm sunny spring day, this warms the soil better than anything, especially when using the dark plastic trays with a clear dome. Of course they'll need carried back indoors when the temperature drops at night. Here's a great chart that lists different vegetables and the germination rates depending on the soil temperatures. With a little searching on-line you should be able to find specific information for each kind of vegetable. And don't be afraid to experiment, seeds are cheap. Seed two flats and try putting one outside and one in the house, after a few years you'll learn what methods work best for what you're growing.

DETERMINE IF YOUR SEEDS NEED A COLD SPELL TO GERMINATE. If you are just starting vegetable seeds you probably won't have to worry about this. You'll need to learn once you graduate on to other seeds, especially fruits, and wild plants, they often require a certain length of cold before they will germinate. You will need to mimic the natural conditions for these seeds. It's not


difficult, all you need to do is plant the seeds in a tray, water and put the tray outside in January or February (if you live in a cold climate) and they'll germinate when the weather is right in the spring. You can also put the flats in the fridge, but I never have room and the porch is much easier! It's easiest to germinate these types of seeds in their final planting place, especially plants like joe-pye weed and milkweed. Simply gather wild seeds and sprinkle them in your garden in the fall where you'd like them to grow. I'd recommend lightly covering with soil and marking them so you know where you planted them. It would be tragic to pull all the seedlings in spring when weeding, then realize they were the seedlings you planted 5 months ago!

SOME SEEDS DO BETTER IF THEY'RE SCARIFIED, which helps the seed break through its hard outer coat. Some common vegetables like squashes germinate better if their seeds are scratched or nicked before planting. Others prefer to be soaked for a few hours to soften the hard seed coating, like nasturtium and peas. Some seeds also prefer to travel through the digestive system of a bird or animal before germination, like strawberries, blackberries and other fruits. I don't always scarify seeds, but I like to ensure the best possible germination so I usually try to remember. Squash seeds I usually rub on an emery board lightly on the flat side and the edges, and I soak peas, beets, and nasturtiums for a few hours before planting. Scarification isn't always necessary as a cold spell is for some plants, but you'll have better germination if you do it.

Lucky for us edible gardeners, most vegetable seeds are ready to germinate. All they need is water and warmth and they'll spring forth with their tiny green shoots ready to propagate their kind. Once you have great germination rates with vegetables, try moving on to seeds that need stratification and try your hand at those. I enjoy starting vegetables that are easy, but I also enjoy the challenge of starting other more difficult things from seed, like ladies mantle, joe pye weed and soapwort.


## Light for Your Seedlings

Providing the right amount of light for your seedlings is something you will need to consider when you start seeds indoors. Putting your seed trays in a window will not provide enough light, your seedlings will most likely become leggy while reaching for the light. This will start your seedlings off to a weak start, not something you want. If you want to start seeds indoors, you will need to provide extra light for your little plants. There is no need to go out and buy expensive grow lights, simple fluorescent shop light

fixtures from the hardware store will do. That being said, grow lights often have larger reflectors on top and provide a little more light. If you're new to seed starting and only plan on starting a few flats each year, I'd highly recommend a tabletop grow light system like this one. They are very convenient and easy to use, I have two small 2 foot ones that my mom gave me and I use them all winter long to grow lettuce and herbs indoors.

HOW MUCH CAN I FIT UNDER EACH LIGHT? Each four foot light will allow you space for 2 flats of seedlings. You must put the seedlings trays lengthwise under the lights, if you try to fit four, your seedlings on the edges will get leggy growing in towards the light. If you have a very sunny south facing window, it is possible to put the grow light by the window so that the seedlings get extra sunlight, then it is possible to fit four under each light. If you only have one or two grow light you can rotate flats of seedlings so each flat will get 12 hours of light. Most seedlings will do quite well with that amount of light. If you have enough grow lights for all your seedlings you can set them on a timer to get 14-16 hours of light (unless you're growing long day onion seedlings which should only get 12 hours of grow light time).

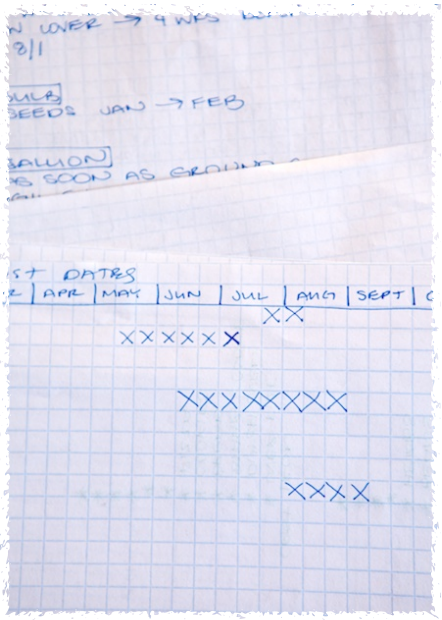
PLACE LIGHTS ONLY A FEW INCHES ABOVE THE SEEDLINGS. If the lights are too far away from the seedlings they will grow leggy stretching towards the light. This will create weak plants that have a tendency to flop over. Raise you light as your seedlings grow. If you don't have a dedicated seedling light table with easily moveable lights, you can simply prop your seedlings up on extra trays flipped upside down to hold them closer to the light. This makes it easier to lower each tray as needed rather than trying to adjust the light.

## Watering Your Seedlings

Watering your seedlings can be tricky. You want to provide the right amount of moisture without overwatering. It has been said that the number one cause of houseplant death is overwatering. Most people assume that plants want to have wet soil all the time, this is not correct. Do not overwater your seedlings or you will have issues, not just with them dying but also with other diseases and mold.

A good rule of thumb is to water when you notice the soil drying out. I generally use the heaviness test, when I lift up the edge of the tray and it seems light, I know the seedlings need water. You'll get the hang of how much water to give them after a while. If you notice your seedlings are wilted, water well immediately. If you notice quick enough they should bounce back. If not, start again and water a little more frequently.

There are many different thoughts on how best






to provide water for your seedlings. Some people prefer to only water from below, others from above. I personally like doing both. My favorite watering method is to use spray bottle to keep the soil moist and an old dishwashing liquid container for direct watering.

# My Workflow

Now that you've chosen your container and your soil mix, and determined the needs of your seeds, now it's time to plant them. After starting seeds for a few years you'll develop a work flow that works for you, but it can be beneficial to see how others do certain tasks. You might learn something interesting, or learn a new way to do something. Today I thought I'd share my system. Usually in January I'll sit down and figure out a schedule of when all the different kinds of plants need started. Johnny's Selected Seeds has a nice calculator on their website you can find it here. They also have a fall planting calculator, but it's a download so I won't include it here. I do this each year and adjust by my previous year's experience (for example, I like to start onions about a month early to allow for slow germination that can happen with onion seeds).

The first thing I do when I'm going to start some seeds is to figure out what I'm going to be starting. Since each kind of plant has a schedule for how many weeks before frost they need to be started, you don't start everything at once. Usually it's onions/leeks first, then a few weeks later, broccoli/cabbages, then peppers/tomatoes, etc. Knowing what kinds of seeds I'm starting also helps me choose what cell size I plan on using in my flats. Plants that will be transplanted outdoors sooner are generally planted in smaller cell flats. Check on your seed packet, the general rule is to use smaller cells for plants that can be planted closer together.

This also helps with seed organization. I organize seeds by type and by season (so spring brassicas & fall brassicas, etc). I can get out a folder and all of that kind of seed is in there and I don't have to worry about checking which ones I plant in the spring and which ones get planted in the fall. I also don't have to sort through my entire seed stash to find all the tomato seeds, because they're all in one folder. For more info on my seed storage/organization system see this post.

Let's say I decided to start onions first. I fill 2-3 seed flats with 2 inch cells full of my homemade seed starting mix. I add boiling water and wait for the soil to become well moistened. Then I pour out the excess water standing in the bottoms of the trays and set them aside to seed in a day or two. This allows some of the moisture to evaporate, you don't want to the soil to be too soggy!

The next day I add 3-6 onion seeds per cell (with some vegetables that have a higher germination rate, like tomatoes and cabbage I only use one seed per cell, I'd rather have empty cells than several plants in each cell). Make sure to label well, especially if you're planting different varieties in the same flat, I usually do one or two rows of each variety (in the case of onions I do entire flats of each variety). I then sprinkle some seed starting mix over the seeds to cover with an eighth of an inch of soil mix (experts say to plant a seed 1 to 1.5 it's width) and I spray the dry mix with a spray bottle to moisten it. Sometimes I add a clear plastic dome, sometimes I don't, depends on the type of seed and whether I have one available. If I'm using a heating mat, I definitely cover with a dome to conserve heat.

The flats are then put under a grow light or on the front porch if the weather is nice and I watch for the first sign of germination. When I spot the first signs of life, the dome comes off, this helps avoid dampening off and other diseases. If the weather is nice, they stay on the front porch where they will get sun for most of the day, I only move them inside if it's supposed to be too cold. This saves me time since I don't have to harden off the plants come late spring, which can take a lot of time and effort! When the tomatoes get their second set of true leaves I transplant them into larger pots and when the weather turns nice they get planted in the garden. I watch my trays of seedlings and only water when the soil is dry, allowing the soil to dry out helps keep them healthy.

## Diseases and Problems

Now that you've started your seeds and they've germinated you may encounter a few problems or diseases. There are all kinds of problems that can plague your little seedlings, dampening off, legginess, nutrient deficiencies, too much watering, not enough light, etc.

Probably the most common problem when it comes to seed starting is legginess, or tall spindly seedlings. This is caused by lack of bright enough light. Make sure you PROVIDE YOUR SEEDLINGS WITH A STRONG LIGHT SOURCE. If you start your seedlings by a window you'll notice that they grow longer and towards the window, they're searching for light. When your seedling do this they're using up energy growing tall and spindly, and they won't be as healthy as if they were given a good strong source of light. If you're trying to grow seedlings indoors you just about have to provide an artificial light source. I try to start my seeds in flats on the front porch where they'll get strong real sunlight or under some bright plant lights indoors. If you keep you seedlings under light make sure they're close, within a few inches. Move the lights up as the seedlings grow taller. If your seedlings are getting enough light they'll look strong and sturdy. One way to add more light without adding more lights is to add mirrors on the sides of your light table. I have mirrors leaned up against the wall behind my seedling shelf.


Dampening off, is probably the most common disease when starting seeds. It's a fungus that can attack the seeds as soon as they germinate or after the seedling has emerged. You will know this is what killed your seedlings when you

notice dark spots on the stem right at the soil level and the seedling topples over and withers away. There are several ways to help prevent dampening off, the main one being DON'T OVER WATER. This is the most common mistake when people try to grow houseplants and start seeds. Let the soil dry out before you water again, and don't water too much at once. I have read that watering with chamomile tea helps, but I haven't tried this personally. Another way to help reduce the risk of dampening off is to PROVIDE AIR MOVEMENT. I have a small fan that I use in my indoor my seed starting area. If I have the plants outside I make sure they're in a place where they'll get a breeze.

You may also have issues with nutrient deficiencies depending on the type of starting medium you use. I usually mix in some Dr. Earth Organic Starter Fertilizer in with my seed starting mix and or sometimes water with a half strength seaweed mix. If you notice the leaves on your plants turning purple (with the exception of some tomatoes whose leaves are slightly purple naturally) or if you notice the leaves turning yellow or the seedlings languishing you've mostly likely got a case of nutritional deficiency on your hands. If the leaves are purple then you'll need to add some phosphorus. If you notice the leaves turning yellow and the seedlings not growing much you most likely have a nitrogen deficiency. Seedlings are tiny plants, they won't be able to handle a full-strength dose of fertilizer otherwise you'll burn the little plants. Make sure you USE HALF STRENGTH FERTILIZER when feeding your tiny plants. I'd recommend trying a balanced fish/seaweed emulsion that's easy to mix up at half strength. I have tried many and find Organic Neptune's Harvest Fish & Seaweed Fertilizer is the best. Don't even bother with the cheap ones, they smell terrible and don't work very well. Also if you have them outside do not foliar feed in mid afternoon when they'll be getting sun, that can also burn plants.

There are a host of things that can cause your seed starting efforts to fail. Starting seeds too early, temperature fluctuations, too much water, too little water, too much fertilizer, not enough fertilizer, all these things can cause poor germination or the death of seedlings. It may take you a while or a few lost trays before you get it right, but once you do you'll know exactly what to look for and how to deal with these problems. You'll know how often to water and when and how to fertilize and pretty soon you'll be starting flats and flats without any problems!

# Hardening Off

If you've grown your seedling inside under lights they'll need to be hardened off before planting them in the garden. They're not used to the harsh real sunlight or the changes in temperature that happen in the spring. Since seedlings are still small plants they're more affected by these changes, especially if they've been living the good life inside your climate controlled seed starting area. Now that the danger of frost is over and the night time temps are regularly above 50 you can start hardening off your tender plants.

Hardening off isn't that difficult, but it can be time consuming. You want to expose your plants to the outdoor elements gradually. Usually you'll start with 2-3 hours and work your way up to 10-12 hours. If you have a sheltered location that gets morning sun you can put them in this spot and move them around the garden to locations where they'll get more and more sun each day. I like to harden off seedlings on my front porch, they get afternoon sun and nice breezes, but they're protected from getting sun all day long. They also stay warmer at night because of the porch roof. Some people use their cold frames to harden off their plants since it keeps the temperatures warmer overnight. You'll have to use a shade cloth in combination with your cold frame though if your seedlings haven't been exposed to a lot of real sunlight.

Personally I'd rather have my seedlings exposed to the natural elements for their entire lives, but the weather doesn't always permit this (especially here in NE Ohio). If it's a mild spring I'll carry all my seedlings out and leave them on the front porch, only bringing them inside when the temperature dips into the 40's. If I'm lucky I'll only have to carry them in a few evenings a week, if it's a cold spring I spend a lot of time carrying them in and out of the house or garage. It's worth the effort though, because I believe the little plants do much better when grown in their natural conditions. I'm considering investing in a nice shelf with wheels so I can just wheel them out into the sun and back into the garage at night. But for now I'm happy to carry them in and out, it's good for the biceps.

# Transplanting


Now that your seedlings are hardened off it's time to transplant them. You may think that all you have to do it plunk it in the garden and you're good to go, but that is not the case. Transplanting is stressful for little plants. We all know that stressed out plants aren't as healthy and can succumb to diseases and insect problems more quickly than healthy plants. It would be a tragedy to go to all that hassle of starting and nurturing seeds, harden them off and then lose them because of transplant shock. There are a few things that will help your plants make it through transplanting with less stress.

The first thing you want to consider when transplanting is to MAKE SURE IT'S THE RIGHT TIME. You don't want your seedlings to experience too stressful of weather conditions (depends on the type of plant, cabbages can take colder weather, peppers can't). Make sure the threat of frost is over and that the night time temperatures aren't too low. When the weather is right, pick out the spot in the garden for your plants and make sure it's amended, free of weeds, and ready for your plants.

Of course you want to MAKE SURE YOUR PLANTS ARE PROPERLY HARDENED OFF, this is probably one of the biggest mistakes people make. They put the plants outside for a few days and assume they're ready for the full-sun garden area. Take your time when hardening off your seedlings, they'll do so much better if you've been patient during the hardening off period.

Pick an OVERCAST DAY to transplant your seedlings, or transplant them in the evening when the sun isn't as hot. Your little plants will already be stressed from being disturbed during transplanting, don't exacerbate the stress by planting them out in the morning on a hot sunny day.

Make sure you TREAT YOUR PLANTS GENTLY. Handle your plants by their leaves, they can do without a leaf or two, but breaking the stem can mean the end of the little plant. Disturb the roots as little as possible when you take them out of their pots to plant them in the ground. When you break and disturb the roots the plant loses its ability to take up minerals. There are many people that recommend watering with a weak fish emulsion or foliar fertilizer after transplanting. I usually water them in with a weak seaweed fertilizer.

You also should make sure you TRANSPLANT AT THE PROPER DEPTH. Some plants, like tomatoes & peppers can be planted deeper because they'll grow new roots along the stem wherever they touch the soil. I always transplant my tomato seedling deeply, usually level with the bottom of the first set of leaves. Plants

like lettuces like to have their root balls a little higher than the surrounding soil level, but most plants like to be planted at the same depth they were in their pots.

## Learn More Each Season

Now that you've gone through an entire season of seed starting, you need to take some time to sit down and review your successes and failures. Taking stock of what worked and what didn't is an important part of being successful year after year at seed starting. By doing this you'll learn from your mistakes and hopefully not make them again. It will also help you understand the exact needs of your garden and climate. You'll also start to develop techniques that work well for you and you'll start to figure out which methods you prefer.

If you make the extra effort to experiment with a few types of plants each year, you'll develop your own successful techniques much quicker. Perhaps you can try germinating a flat of peppers with a seedling heat mat and without, see if it's worth the extra money to invest in a few heating mats to ensure better germination. You could try direct seeding some onions and starting some in flats indoors to see which option works best in your garden. For example, this year I didn't start my lettuce until February. Now, I know I need to start lettuce in January each year so I have nice seedlings to transplant into the cold frame as early as I can.

Since each area in the garden is essentially its own microclimate you will learn more and more about it each year. You may find that because your garden is sheltered by large trees and you live on top of a hill, this allows you to plant things out a week or two earlier than those that live in low-lying areas nearby. Or you may find that your garden collects cold air and you need to plant a week or two later than those around you. This is a great time to start planning your seed starting calendar for next year so you remember what you want to start earlier or later.

Spending some time thinking about the seed starting season will also help you identify your limits and boundaries. Perhaps moving 15 trays of large plants in and out of cover during weather changes was more work than you are willing to put in. From now on you can start your tomatoes a few weeks later so you only have to move a couple trays of small seedlings. Then you can plant them directly in the garden when the weather is warm. Maybe after a year of seed starting you'll realize that it's not for you, and you decide that you would rather purchase your seedlings at a local greenhouse. If you don't take the time to sit down and think about these things after the seed starting season is over you may forget by the time planting season rolls around next spring.

# Support

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# Resources

***This is by no means a comprehensive list. The companies featured here are companies I have purchased from and have found to provide great products.***

***Seed Starting Supplies:***

Check your local greenhouse, they often carry everything you need and will provide you with advice as well.

Johnny's Selected Seeds: seed trays of varying shapes and size, soil blockers, etc.

Peaceful Valley Farm & Garden Supply: everything you need for seed starting and growing

Southern Exposure: Perma-nest trays (longer lasting rigid seed starting trays) wooden plant labels, etc. Not as large a selection as Johnny's or PVFS but they carry a good number of items. If you're buying seed from them it might we worth buying your supplies from them as well.

***Seed Companies:***

I have a large list of seed companies on my blog. This list consists of small companies that are committed to selling high quality OP, hybrid or heirloom seeds. Most of them have taken the Safe Seed Pledge. I won't list them all here as I curate the list on my blog regularly when I find new companies. Head on over and see the list here.

***Plant Labels:***

You can easily use popsicle sticks, large or small. Make sure you use a weatherproof marker, Sharpies will fade in the sun. You can also use a grease pencil or a regular pencil to mark on them. I prefer using these large markers from Southern Exposure, I buy them in lots of 200 for around $35. You can also easily make your own labels out of household items, some people cut up milk jugs. I tried this one year and didn't like the results. I prefer wooden markers that can be composted.

***Seedling Heating Mat:***

A worthy investment if you think you will be starting seeds each year. It greatly increases germination rates and speeds germination for many heat loving crops like tomatoes, peppers, onions, etc. I'd recommend purchasing a larger one if you think you will need it. It's not much more expensive than a smaller one and can fit four seedling trays instead of just one.

# shelf life of seeds

| 1 year | 2 years | 3 years | 4 years | 5 years |
|---|---|---|---|---|
| parsnip | parsley | pea | brussels sprouts | cabbage |
| leek | corn | carrot | mustard | broccoli |
| onion | okra | asparagus | pumpkins | other brassicas |
| chive | wheat | bean | other squash | celery |
| | oats | basil | tomato | cucumber |
| | rye | dill | beet | eggplant |
| | sesame | fennel | pepper | kale |
| | | flax | clover | endive |
| | | quinoa | | rutabaga |
| | | | | spinach |
| | | | | lettuce |
| | | | | radish |
| | | | | melons |

Length of storage life also depends on humidity, temperature and other storage factors.

For best results, store seeds in a cool, dry location.

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