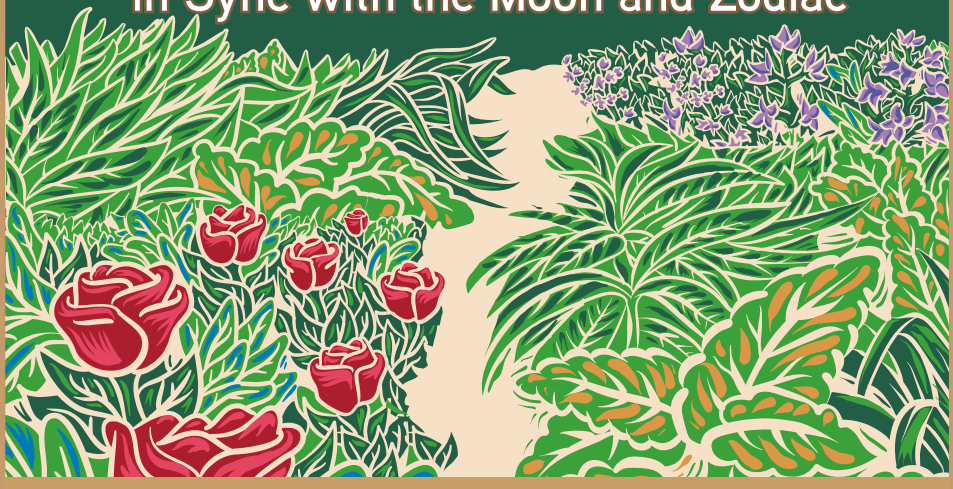
THE CELESTIAL GARDEN

Growing Herbs, Vegetables, and Flowers in Sync with the Moon and Zodiac



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FOREWORD BY ROSEMARY GLADSTAR

CHAPTER 5

New Moon Gardening Activities

Picture yourself grabbing a seed packet in the early spring. The packet label reads *Calendula officinalis*. You open it; the seeds look like little tan-colored smiles. The moment is full of expectation and wonder. Will the seeds germinate? Will they produce yellow flowers, or orange? Will they grow into something beautiful, worthy of your efforts? Will the weather assist them or curse them? How is it possible for these featherlight seeds to hold all the genetic material that imbues calendulas with their topical healing and antifungal power, complete with a Neptunian glimmer on their petals? This moment depicts the New Moon for gardeners. Like the moment of childbirth, it holds the mystery and wonder of life. It is a dormant time, but you hold seeds in your hand and your soil is ready to receive them.

The New Moon holds the energy of renewal. Also called the dark of the Moon, this inward time offers great potential and energy, but it is difficult to see how things will manifest. We are in a dreamlike stage, returning from the void. I have seen David lie down and rest for hours at the time of the New Moon, even though it's his nature to run around constantly getting things done. It's a remarkable change of behavior for him, and I find it relaxing just to witness him so fully enjoying a brief time of rest.

The word *inspiration* shares a connection with the word *spirit*. *Inspirare* is Latin for "to breathe or blow into," like a friendly spirit giving you a personalized insight. The New Moon is the time for inspiration,

The New Moon by the Numbers

The New Moon begins the lunar month; it starts at day one and continues for the first week. The New Moon rises and sets with the Sun, shifting 50 minutes later each day after the exact New Moon. Because the New Moon is out during the day, from about six a.m. to six p.m., it can be very difficult to distinguish in the bright daytime sky.

As the New Moon begins, the Moon changes from 0 to 45 degrees of illumination (from our perspective on Earth), with the right half of the Moon's disc growing in light.

The Waxing Crescent arrives three and a half days after the start of the New Moon and lasts to day seven. During the Waxing Crescent, the Moon increases from 45 to 90 degrees of illumination.

for visualizing what you want to create. This period of darkness and inward focus would be a great time for garden design, hearing whispers of distinctive plants that speak to you in the quiet. Bitters, immune support, hormonal balance, liver cleansing—what do you think you need? I believe plants want to support us. Plant them wherever you can, whether it's in a garden or in pots, or if need be, in the garden at a friend's house. This is a mutual love affair waiting to happen!

Someone I know without garden space rogue-planted in open public places or empty lots for a later harvest. This practice became a movement in Detroit and other places, where people would plant vegetable gardens and fruit trees in open, unused ground, with the intention that anyone could harvest their plantings. Urban agriculture or agrihoods are recreating civilizations that connect people and plants for increased health, access to fresh foods, and the common good of all, where neighbors meet over fresh produce. This seems way more sensible than golf courses!

The New Moon is invisible, hidden in shadow between the Earth and the Sun, with its lighted face toward the Sun. Because the Sun and

the New Moon are lined up on the same side of the Earth, they move into the same astrological sign at about the same time. Thus, when the Sun moves into the constellation of Aries, it is also a New Moon in Aries. The following month as the Sun enters the constellation of Taurus, the New Moon is in Taurus, too.

Sowing Seeds According to the Moon's Influences

Although the moment of a New Moon holds the mystery of the darkness, it doesn't last long. After all, those seeds are in our hands, the soil is ready.

Did you ever watch a seed germinate, with the radicle or first root initially popping out of the imbibed seed? This is the energy of the Waxing Crescent, which follows the New Moon. The Waxing Crescent is a time of beginnings and has the momentum to get things started. Sowing Seeds for Growth is the slogan during this phase, both in our lives and in our horticultural endeavors.

The energy of the New Moon shifting to waxing is subtler than at the Full Moon.

This time of visualizing outcomes and starting seeds is a perfect match. As you sow your seeds, imagine the beautiful photos of the plant as you have seen it in catalogs or online, or reflect on the potent medicine it contributes and has become known for through the ages. By sowing seeds, you are taking the unmanifest into a place of fruition—a perfect activity for the New Moon and Waxing Crescent.

Sowing seeds is one of the most important times to pay attention to the Moon's influence, especially when planting seeds directly in the garden. When you are sowing seeds in pots or flats, it is still a matter of debate whether

Keywords for the New Moon

Beginning
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Expanding
Exploring
Gaining insights

I keep a patch of garden closer to the house for an early crop of greens. Radicchio, lettuce, and fennel. Yum!

the lunar influence is important. My experience tells me that even seeds sown in flats or containers in a greenhouse will feel the magnetic pull from the Moon during this phase and will also be subject to the prevailing zodiacal influence. The energy of the water table is still rising, which would offer an upward momentum.

The best signs for planting are the moist signs of the elements Water and Earth. The Earth signs—Taurus, Virgo, and Capricorn—are especially good for root growth, but are moist and so are still recommended for planting seeds. Virgo is an anomaly and is not recommended for fruiting plants but for beauty. The other planting signs are the Water signs—Cancer, Scorpio, and Pisces—which are recommended for leaves and stems. They are moist signs and are good for planting. Any of these are a good time for strong leaf growth. Leafy crops and grains are especially favored during this first week of the cycle.

More generally, the New Moon favors annuals, plants whose life cycle is completed in one year. They go from seed, to flowering, and back to seed in one year. This New Moon phase is the best time to plant crops that produce their seeds outside the fruit, such as lettuce, grains, spinach, broccoli and other crucifers, flowering annuals, and leafy herbs such as mints and basils.

Cucumbers seem to be an exception to this rule, perhaps because they are so leafy and need lots of moisture to produce. Even though their seeds are inside the fruit, they do well when planted in the First Quarter, the week after the New Moon.

An ancient agricultural practice in Germany calls for planting lettuce only during the waning Moon, perhaps to keep the plant more sturdy and less likely to bolt early. Maybe this is why I have had varied luck with my most frequently planted crop, lettuce. Here in Zone 4, I plant lettuce once a month from March to early September. I sow the September crop in a bed in a greenhouse for the fall and spring harvest. Lettuce seed does not germinate when ambient temperature is over 80°F (27°C), so during the hot months. I sow a flat of seeds in the basement, providing some light because the seeds are light-dependent germinators. My salads are popular at potluck dinners because they are always so fresh and vibrant, and I enjoy them immensely during their seasons.

More Gardening Tips for the New Moon and Waxing Crescent

- ★ Add lime to the soil in the New Moon or First Quarter, (waxing Moon) by the end of February, in a Fire or Air sign.
- ★ Repot geraniums.
- ★ Erect fences, especially in Capricorn.
- ★ Cut back diseased or weakened plants for rejuvenation. In fact, diseased or damaged plants can recover better when cut back during this rejuvenating time.
- ★ Prune for more growth. Soil moisture is up, causing plants to swell. Pruning helps this liquid life from the Earth move in the right direction—toward buds held in place until they are triggered to expand. Light, temperature, and day length influence bud break, as well. Pruning helps the favored buds break and timing will increase the flush of growth.
- ★ Turn the soil for aeration between the New Moon and Full when there is less moisture in the soil. It is lighter and easier to work. This is best done in a barren sign such as Gemini, Leo, or Virgo, and as second best, Aries, Capricorn, and Aquarius.
- ★ Plant annuals that grow their seeds on the inside of the fruit—such as beans, melons, peas, and tomatoes, particularly if you are growing crops to harvest the seed for either future plantings or edible use.

A Note on Medicinal Herbs

Herbs have archetypes, just like humans, and develop with the same cosmic influences as we do. Open your mind to discover connections to help you to learn how the plants work, how planets influence environments and health, and what a person is lacking or what part needs support. This is one reason I love herbalism so much. It is interactive. You uncover an imbalance your body is communicating to you, and you

do research to see what herbs can support that body system. Usually, before long, you'll find that an herb or two keeps popping up, either in your research, or in your life.

Years ago, I noticed a small wart on my finger. I looked up information on plants than can be used to dissolve warts. Then, within a week, a new plant that I did not recognize started spreading in a bed just under my living room window. I keyed it out and learned that it was celandine (*Chelidonium majus*), one of the herbs recommended for treating warts. I tried applying the crushed leaf directly on the wart for a week, and *voila*, it worked like a charm. Having experiences like this builds trust that there is communication and support coming from Nature. Practicing herbalism is interactive, like calling a friend to join you for an activity but the friend is a plant.

Looking to be aligned with larger unseen influences for when to plant, harvest, or make medicine can give you insights into the medicinal messages of herbs, connecting the constituents to the spirit of the plant. We are all made of stardust. Or if that is too esoteric, look at the science showing the paths that connect herbal constituents to the body's physiology. David Hoffmann, British herbalist, phytotherapist, and author of seventeen books on herbs does a great job of blending traditional plant lore with phytochemistry. Also check the American Botanical Council for the science inside these potent healing plants.

To potentize your medicinal herbs, select the day that governs the plant you are working with to properly align with that body system. Say you want to make a brain tonic using ginkgo (*Gingko biloba*), gotu kola (*Centella asiatica*), and rosemary (*Rosmarinus officinalis*). You may choose to make it on a Monday, the day that is associated with the Moon, which governs the brain (as shown in Table 5.1). You can harvest the herbs and/ or make this remedy on a day governed by Aries, which rules the head. Besides utilizing the astrological forces available, you are partnering your intention with the process.

You can select times for your sowing, harvesting, and medicine making according to this system.* The planetary hours developed

* You can also find the planets governing the hours of any given day on these two websites: https://www.lunarium.co.uk/planets/hours and https://planetaryhours.net.

Table 5.1 Potentizing Medicinal Herbs

Day	Planet	Inner Being and Energy	Body System
Sunday	**Sun**	the higher self, inspiration	heart, cardiovascular system
Monday	**Moon**	the unconscious, instinct, emotions, emotional connection	stomach, autonomic nervous system, fluids, digestion, brain, lymphatics
Tuesday	**Mars**	vitality, power, action	blood, muscles, reflexes
Wednesday	**Mercury**	the mind, communication, speech, respiration, connection	central nervous system
Thursday	**Jupiter**	hope for the future, joy, expansive, creativity	liver system, thighs, fats/oils
Friday	**Venus**	inner lover, beauty, harmony, comfort, desire	reproductive system, kidneys, thyroid
Saturday	**Saturn**	integrity, structure, foundation, discipline	bones, joints, connective tissue, skin

around 100 BCE, during the Hellenistic astrology era. Starting with the days of the week rulership, planetary days begin at midnight.

The Miracle of Seeds

From childhood, I have been fascinated with seeds. Blowing on the flower stalk of a dandelion took me to a place of wonder as each seed (technically speaking, each fruit) floated on its pappus, or feathery bristles. I watched them artistically dance through the air, and I absorbed and followed the beauty and symmetry of Nature. Dandelion blossoms

Herb	
hawthorns (*Crataegus* spp.)	sunflower (*Helianthus annuus*)
angelica (*Angelica sinensis*)	St. John's wort (*Hypericum perforatum*)
bee balm (*Monarda* spp.)	
marshmallow (*Althaea officinalis*) root	oat (*Avena sativa*)
plantains (*Plantago* spp.)	mugwort (*Artemisia vulgaris*)
wood betony (*Pedicularis canadensis*)	
arnica (*Arnica montana*)	echinaceas (*Echinacea* spp.)
pines (*Pinus* spp.)	chamomile (*Matricaria chamomilla*)
rehmannia (*Rehmannia glutinosa*)	yarrow (*Achillea millefolium*)
nettles (*Urtica* spp.)	
ginkgo (*Gingko biloba*)	rosemary (*Rosmarinus officinalis*)
gotu kola (*Centella asiatica*)	mints (*Mentha* spp.)
wood betony (*Pedicularis canadensis*)	skullcap (*Scutellaria lateriflora*)
dandelion (*Taraxacum officinale*)	American ginseng (*Panax quinquefolius*)
burdock (*Arctium lappa*)	rosehips (*Rosa* spp.)
magnolia (*Magnolia officinalis*) bark	borage (*Borago officinalis*)
rose (*Rosa* spp.) petals	damiana (*Turnera diffusa*)
lemon balm (*Melissa officinalis*)	eleuthero (*Eleutherococcus senticosus*)
schisandra (*Schisandra chinensis*)	blue vervain (*Verbena hastata*)
comfrey (*Symphytum officinale*)	nettles (*Urtica* spp.)
Solomon's seal (*Polygonatum biflorum*) (*Polygonatum* spp.)	horsetails (*Equisetum* spp.)
	oaks (*Quercus* spp.)
mullein (*Verbascum thapsus*)	teasels (*Dipsacus* spp.)

excited me enough to pick a bouquet for my mother. I might have been five years old, and I remember she did not find those flowers sophisticated enough for her taste. But I was charmed, and I still love dandelions.

I also find spring enchanting, perhaps because I live where the ground is frozen and (hopefully) covered with snow for months. When the first warm weeks present themselves, the spring ephemerals emerge with their short-lived beauty. In this season of my birth and starting seeds, pure excitement bubbles within. After so many years of this ritual, it feels like greeting familiar faces as I identify the seeds of the plants I want to grow. Their shapes and colors are enchanting, from

the crumpled texture of round nasturtium (*Tropaeolum majus*) seeds to the tiny seeds of tobacco (*Nicotiana* spp.), no larger than specks of black pepper coming out of a shaker.

From my vantage point as a farmer, I wonder whether those who don't work with plants understand the magnificence of seeds. I am in awe when I pull out my box of seeds in January and realize how they will turn into jars and even freezers full of produce, thousands of pots of tea, herbs that support every body system, a multitude of vases of flowers, and more. How amazing is it that a simple tomato seed holds the potential, when properly placed and cared for, to create vitamin- and flavonoid-rich fruit, full of life-sustaining compounds and complete with next year's seeds! Each seed has a unique shape, color, and texture. They are humble but mighty. We must demand an end to GMO seeds to keep this circle of life intact.

Seeds are amazing, but they come from Nature with no promotional plan to grab your attention. (I am happy that seed catalogs do this for them.) It is easy to be in awe of our phone/camera/mailbox/banking/music/podcast gadgets, but a seed holds enough data to humble an iPhone. When I cradle a seed in my hand, I marvel at all the information stored inside—complex adaptations developed over millennia to survive challenges posed by climatic conditions, soil, pests, and diseases, and more. For many seeds, releasing the potential of all the wisdom gained for thousands of years is as easy as settling the seed in the right seed-starting medium or soil, usually in warm temperatures, and adding water and light (or darkness if that's what the species requires), and it sprouts!

It's a frightening statistic that 93 percent of seed diversity has been lost in the last 100 years. Much of the loss is due to choices made by large seed companies to condense their variety offerings, narrowing diversity to a thin band of genetic material. Fortunately, small companies and home seed savers are working to conserve and promote open-pollinated and traditional varieties.

I do consider hybrid varieties to be a good choice in some cases, especially for disease resistance. Hybrids are simply the progeny of two different parent varieties. After all, people always have wanted to play with plants, and this cross-pollination is sex in action. Traditional hybrid breeding is different from the production of GMOs (genetically modified

organisms, whose genes have been altered in a lab and are often marketed by companies with questionable integrity). If you want to know more about the harmful effects of production and use of GMO varieties, I recommend the writings of Indian environmentalist and activist Vandana Shiva. This is a case where we were sold a lie, that this system could reduce starvation, while the numbers of underfed and underserved people continue to grow. According to the Food Tank, a nonprofit devoted to resolving food insecurity, "In 2022, 735 million people—more than 9 percent of the global population—faced chronic undernourishment. Nearly 3 in every 10 people worldwide face moderate or severe food insecurity. Last year was the 10th straight year that hunger levels increased in Africa. Compared to 2019 pre-Covid levels, 122 million more people went hungry last year." These robber baron companies pollute, change laws for their benefit, and limit what seeds are available for farmers to grow. In my area of rural Wisconsin, one farmer had to drive two hours to a seed supply store, passing dozens of others, to get non-GMO corn seed. This sad story has developed over the past twenty years.

The Pleasures and Advantages of Seed-Starting

Why would you bother to start sowing seeds indoors in February or March when transplants can easily be purchased at garden centers in May?

First and foremost, you will experience the thrill of watching seeds germinate, the first tiny seedlings poking up through the growing mix.

In terms of plant choice, the sky is the limit when you order seeds from seed companies. Specialty catalogs offer an expansive choice for almost any kind of plant: annual flowers, perennials, medicinal herbs, vegetables. You might even enjoy the challenge of starting seeds of woody plants.

When you start with seeds, you also have a much wider choice in the color, shape, and flavor of the species that you want to grow. And if you want to grow hard-to-find herbs or perennials, you will have a broader range of selections from seed catalogs. (Here's a tip—if you don't have time or space to start all your plants from seed, shop for plants at a local farmers market. You can often find a good selection of started plants there.)

The plants you grow from purchased seeds will be true to type—most of the time. Most seed houses are reliable in their labelling of the seeds they sell, but every once in a while, I have seen weird mistakes from purchased seeds.

You can time your planting work for days when the Moon is under the correct influence to maximize a successful growing season. You can even fine-tune your desired outcome for a specific use by planting under the appropriate sign that governs that body system.

You can maintain control over the quality of your plants as they grow, and you can make sure they are watered as often as needed and never suffer nutrient deficiency. Transplants at a retail store often aren't watered in a timely fashion, which causes cell structure to break down and the plants may lose leaves. If the plants are left too long in small six-packs or pots, they develop very tight root balls that won't adjust well after transplanting. Plants that have suffered such stresses have a much harder time maximizing their genetics, even if you give them good care after transplanting.

Another tip: If you do buy transplants and discover they have tight root balls, you may be able to encourage more robust growth of

This flat of tulsi germinated in only five days when planted under the influence of a Cancer Moon. It made my eyes pop! (Tulsi usually takes about six days to germinate.)

new roots by cutting off the bottom portion or tearing a piece off of the tight area of the root ball just before you set the transplants into a garden bed.

You will learn more about and feel greater kinship with plants that you grow from seed. As dedicated seedsman Richo Cech of Strictly Medicinal Seeds says, "Grow it to know it."

Getting Ready for Seed Starting

My first step in the growing season is to take inventory of the seeds I have left over from previous years. A digital spreadsheet works well for this task because you can add new columns or tabs for each new year.

Keeping Seeds Organized

If you store seeds from one year to the next, keep them in a cool, dark place with low humidity. Warmth, light, and humidity can ruin viable seeds. I keep seed packets in a tightly sealed plastic bin in the coolest part of a dark basement. I separate them into groups: herbs, vegetables, root crops, and flowers.

Because I have been saving my own seeds for many years, I find it worthwhile to buy 2 × 4-inch (5 × 10 cm) manila envelopes to store them in. Being one of the ultimate recyclers, it took me a long time to give up my penchant to store seeds in any random envelope at hand, but the uniformly sized packets are much tidier and easier to organize.

Once I've reviewed my inventory and made a list of what I need to buy, I order seeds as soon after January first as I can, to ensure my favorites will still be in stock.

It's a good idea to gather your seed-starting supplies in advance. You will need:

- seeds
- shallow flats/trays and 2- to 4-inch (5–10 cm) pots
- covers such as a clear plastic dome or plastic bag to hold in humidity over the tray
- watering can or hose end with mist/ breaker nozzle
- vermiculite or other light soil medium
- labels (a good trick is to cut Venetian blinds into appropriate sizes)

Generally speaking, you'll want to be ready to start seeds six to eight weeks before outdoor planting time. Here in Zone 4, I start the earliest seeds around Valentine's Day. These are crops that take longer to germinate and grow, as well as those that can be transplanted outdoors very early when it still may freeze or frost. Plants in this category are perennials, parsley, and onions.

Crucifers, like broccoli and cabbage, can be sown a couple of weeks later, about March first. When I calculate seed-starting times and expected transplanting dates, I factor in a period of hardening off before transplanting, as I explain later in this chapter.

Since I mainly grow transplants for my own use, not for sale in nurseries, I do not need to produce showy transplants; I concentrate on producing sturdy plants!

Why I Like Vermiculite

You may be surprised to learn that I sow seeds in medium or large vermiculite, not into a seed-starting medium. (I do put a ½ inch [13 mm] deep layer of soil mix on the bottom of each container or flat to hold necessary moisture, and then straight vermiculite on top of that.) I choose vermiculite because plants need air in order to grow healthy roots. Remember, roots grow in the air spaces between soil particles. Bog plants are a different story; they are adapted to mucky soils and dense conditions. But most vegetables, herbs, and flowers need air in the soil! Novices believe seeds and young plants need water, water, water, but air is what generates root hairs and a healthier root system. Experience will show you how to grow plants in the right state of balance between air and water in the soil. Some seeds like it drier than others.

Experience is worth a lot when it comes to growing plants, but even experienced growers learn more every year.

It is also important to use a "sterile medium" to germinate seeds in containers indoors. When I say sterile, I do not mean absolutely void of any living organism. I mean that the medium must be free of plant pathogens and weed seeds. Outdoors in healthy soil, there is a balance between pathogens and beneficial microbes, which creates a favorable environment for the root growth of new seedlings. Wonderful research by Stephen Harrod Buhner proves how this symphony of life below the

Ephedra sown in vermiculite has germinated strongly, and the seedlings will be easy to lift and the roots will untangle easily when it's time to transplant them.

ground surface functions, including communication between plants. I recommend Buhner's writings for more on this topic.

That amazing balance between pests and beneficials cannot be maintained in small pots, however. If you try to put garden soil into pots and sow seeds there, the results will be ruinous. Pathogens will likely take over, causing the roots to rot, or insects pests may hatch from eggs and infest the seedlings and they will fail to thrive. If weed seeds are present, they may germinate faster than your desired plants

and shade or crowd them out. Thus, I recommend buying bagged light potting soil or plain vermiculite for starting seeds.

If you are adamant about experimenting with garden soil for starting seeds in containers, you will need to sterilize it first. Place moist soil in a pan no more than 4 inches (10 cm) deep and cover the pan with foil. Make a hole in the foil that you can stick a kitchen thermometer through. Set your oven at approximately 180°F (82°C). Monitor the temperature of the soil. Once it is up to 180°F, hold it at that temperature for 30 minutes. Do not let the soil temperature rise above 180°F, or chemical imbalances can occur that will lead to future crop failure. After the soil has been heated long enough, remove the pan from the oven. Keep foil on to hold moisture in. Allow the soil to cool thoroughly before use.

Another reason vermiculite or sterile mix works well for seed starting is that emerging seedlings don't need any external source of nutrients until after their first true leaves appear. That's because seedlings come equipped with cotyledons, or "seed leaves," that are rich in carbohydrates. These first "leaves" are usually easy to distinguish because they are shaped differently from the typical leaves of the species you are sowing (cotyledons are usually oval-shaped). As the seedling begins to grow, it can use the energy supply from the cotyledons to power growth. Once true leaves form, a plant begins to create energy through photosynthesis, and this is when they will need a supply of nutrients for growth. This is when I apply liquid fish emulsion; weekly is not too much for transplants.

Remember the Labels

It's a helpful practice to label all plants and flats as you sow your seeds. You can fill out labels ahead of time and bring the labels and seed packets to the planting site on planting day. Writing labels is a great time to practice Latin names.

Include the plant name and the planting date on each label. I also like to specify the Moon phase at the time of planting along with the zodiac symbol to indicate the Moon's influence. Here's an example:

Echinacea purpurea, 10 Feb 2020, O, ♈

The *O* indicates the Full Moon, and the ram's horn symbol is the sign for Aries.

Step-by-Step Seed Starting

Seed starting is a multistage process. You begin by preparing seed flats or trays and sowing the seeds. After the seeds germinate and seedlings are big enough, the next stage is to transplant the seedlings into containers. You'll tend those small plants until they are about to outgrow the pot, at which point you may need to "pot them on" into larger containers or into the garden or field. You will know the plant needs more space when the roots start growing through the bottom of the pot or begin to get tight in the container.

Preparing Seed Flats/Trays

Step 1. Water your soil medium or vermiculite and mix well to ensure it is thoroughly moistened.

Step 2. Pour medium into a flat or tray (be sure they have holes to allow drainage), filling to ½ to 1 inch (13–25 mm) below the top lip of the container. This gap will help to catch water and ensure complete watering of seeds.

Step 3. Tap the surface of the medium gently throughout the container but avoid pressing too hard. This is just to eliminate air pockets or clumps of soil.

Step 4. Make shallow furrows in the medium with a pencil or knife. Typically seeds should be covered only to a depth of twice their diameter, so keep furrows shallow! Using a pencil or knife will keep the furrows narrow, making them easy to cover later.

Time for Seeding

For small-seeded crops, it's best to start by sowing seeds into flats or trays. With larger seeds such as cucumbers, you can plant the seeds directly into small pots or cells, which allows you to skip the transplanting stage. Note also that seeds of some crops, such as dill and cilantro (coriander), prefer to be sown directly into the garden bed.

Step 1. Read seed packet or catalog information to see whether a species has special treatment requirements for germination, such as stratification (a cold treatment) or scarification (nicking the tough seed coat to allow water in). Some seeds

require light and others dark to germinate. Some are not specific to either condition. Be sure you provide the treatment, if needed, before sowing or your efforts will be for naught.

Step 2. Cut open the packet and gently tap seeds into the furrow, leaving a ¼ to ½ inch (6–13 mm) between seeds, depending on their diameter, so they will be able to emerge freely from the soil. If the seeds land too close together, gently move them apart with your pencil or knife (rather than a finger) to keep the furrow tidy to receive the seeds. Another technique is to mix very small seeds with sand before sowing; this helps to spread them apart.

Step 3. Cover seeds with ⅛ to ¼ inch (3–6 mm) of soil mix, just enough to hold them in place and keep moisture surrounding the seed. Very tiny seeds, such as tobacco (*Nicotiana* spp.), do not need to be covered at all, and in fact may need to be placed on a finer mix, such as medium or fine vermiculite, so they don't wash down too deeply into the mix when you water them. Some seeds need light to germinate, like lettuce, and do not like to be covered at all. The advantage of a little potting mix over the seeds is that it keeps the vermiculite more evenly moist, an advantage to an imbibing and germinating seed.

Step 4. Water thoroughly but gently, so the seeds stay put. To maintain high humidity, cover the flat/tray with a plastic dome cover or slip it inside a clear plastic bag, leaving one end of the bag open to allow airflow.

Step 5. Place the seed tray in a warm spot. Heat mats are best but try to find a spot that is 65 to 70°F (18–21°C). Putting trays on top of a refrigerator can work well because refrigerators release heat to the outside as they cool their interior contents.

Step 6. Be sure to notice the seedlings as they emerge and move the containers under lights or to a brightly lit spot.

Transplanting Seedlings into Pots

As described earlier in the chapter, the cotyledons unfold first after seedlings emerge from the medium. When the first true leaves appear, it is time to transplant seedlings into individual pots. Fast-growing seedlings like basils can be transplanted directly to the field after growing in flats for six to eight weeks (see chapter 6 for transplanting).

Step 1. Water the seedlings well before you begin the transplanting process.

Step 2. Fill pots with soil mix and place them in a flat that holds water to keep your watering in place (and not dripping on your countertop). You can omit this step in a greenhouse that has drainage.

Step 3. Water the pots to make sure the soil is moist. Gently tap the soil surface to make sure pots are full.

Step 4. Water the pots again and then use a marker pen or dibble stick (a tool used to create a hole in soil) to poke a hole in the soil of each pot. The hole should be big enough to accommodate the roots of a seedling.

Step 5. Gently lift the seedling out of the flat/tray using a knife, spoon, or a widger (a scooped greenhouse tool used to lift seedlings), trying to keep all the roots intact. A short butter knife works almost as well. Gently loosen the soil around the newly formed root to lift it out without damaging the plant.

Step 6. Gently lower the roots of the seedling into one of the pots. Be careful not to "J-root" them, because bent roots must work extra hard to orient themselves to grow downward. These seedlings are your babies, and you want to give them an easy start. Cover the roots with soil, but do not push on the soil, because that would compact it and deprive the roots of air. Water seedlings in their new pots.

Step 7. Place them out of the direct Sun until they are thoroughly established in the pots. Grow lights and bright windowsills are fine. Watch to make sure the stems don't become leggy (stretched out); this is an indication that plants aren't receiving enough light.

Newly transplanted seedlings are a bit unpredictable for watering, do not let them wilt, but do not overwater! See the discussion of this in the next section.

When the plants show their first leaves, they are ready for some organic fertilizer. Follow the directions on the fertilizer package. Young plants can be fertilized weekly in this early phase of the growing season. There are several choices of organic fertilizers for potted plants; I use fish emulsion.

Plants are ready to be transplanted either to the garden or into bigger pots when the roots show through the bottom of the container. If the root ball gets too tight within the pot, it can stunt the plant's growth. If you need to transfer a potted seedling to a larger pot, use a 2- to 4-inch (5–10 cm) pot, or whatever size allows more space for roots to grow, but not too large. Too large makes it more difficult to manage the watering properly.

When transplanting a plant that is root bound, loosen up the roots or even cut off the bottom portion of the root ball to encourage new, free root growth that can follow the force of gravity rather than continuing the pattern of circling the pot's rigid sides.

When and How to Water

Watering plants in pots is a balancing act. You are trying to grow a good root system as much as healthy-looking tops, so maintaining soil aeration is as important as watering when necessary. My favorite way to tell if a potted plant needs water is to lift up the pot and feel whether it is light or heavy. Then you don't have to poke into the soil and disrupt the roots. Most transplants suffer from overwatering. Too much moisture in pots causes weak root growth and increases the habitat for fungus gnats and other pests and pathogens that feed off weak roots.

If you have the time to check your seedlings several times a day, it helps to keep them on the dry side to encourage root growth. I cannot overstate how important it is to not overwater transplants. Drier soil encourages healthy root growth and root hairs, therefore, a healthier plant. Of course, if you know you won't be around during the day to catch them at this point, it can make sense to keep them moister. Every time you water, make sure the soil is completely saturated, penetrating to and through the bottom of the pot. Watch them drip to ensure you watered them completely.

Harden Off!

Before plants started in a greenhouse or under indoor lights are transplanted to the field, they need to be hardened off. "Hardening off" is a technique of placing tender, young potted plants outdoors in a protected spot for a few days, which helps to strengthen their stems and

We grow thousands of medicinal herbs, along with some flower and vegetable transplants, in this well-used greenhouse each spring. These plants fill our production fields plus gardens all over Wisconsin. Photo by Diane Lasceski-Michaels

toughen them up in preparation for the full Sun and wind conditions of the garden or production field. If you skip the hardening off period, your tender plants may not do well at all when you transplant them outdoors.

It is startling to see how potted plants respond to exposure to extra light and wind! Hardening off thickens a plant's cuticle so it can withstand the elements and will lose less water through transpiration. Within two days of being moved outdoors, their tender stems will be turgid and tougher, better able to withstand the jostling of transplanting and wind and from the change of overall conditions. This helps to reduce transplant shock so the plant can make a smooth transition to the field. Ideally, harden off plants for a full week, but if that's not possible, even two to three days will make a difference.

Here are some tips for hardening off young plants.

- ★ Once the plants are the desired size for transplanting, place them outdoors in a protected spot, like under a tree or next to a

building where they will not receive full Sun and wind exposure. On the first day, wait until afternoon to put the plants out, so they have only a few hours' exposure to bright sunlight. If it gets too cold at night, plan on bringing them back in. Unless it is cold-hardy, a baby baby plant resents a night when temperatures dip into the 40s.

- ★ Placing the pots on a wagon or wheelbarrow makes it easier to move the plants in and out in case of nighttime frosts or severe weather.
- ★ After about two days, you can move the plants into increased sunshine and wind.
- ★ Be careful with watering. Plants in small pots need more water out in the wind and Sun than they would indoors, and you don't want to eliminate all the progress you and the plants have gained by allowing them to wilt at this point.
- ★ Ideally, transplant on a still, cloudy day to reduce transplant shock. It is a lucky break if you are gifted these conditions!

I pick up the subject of transplanting in the next chapter, as we turn to gardening activities for the First Quarter.