

**The
Strawberry
Growing
Master
Manual**

The Strawberry Growing Master Manual

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INTRODUCTION

Strawberries are the most popular small fruit grown in home gardens for good reason. Few things bring back summer memories like sinking teeth into a fresh and juicy strawberry. Everyone loves them. The small red fruits meld their aroma and taste together perfectly for what many food connoisseurs describe as a truly sublime gustatory experience. So delightful is the fruit that literally billions of dollars are made each year from the sale of the savory succulents. The enormous Californian strawberry companies that produce tons upon tons of strawberries don't want you to know something, however. In fact, they don't want you to know several things...

They don't want you to know that ***you can easily grow your own strawberries at home*** in as little as one half of a cubic foot of dirt! You don't need acres upon acres of land.

They don't want you to know ***how much money you can save by growing your own strawberries*** instead of buying berries from them! Strawberry plants are one of the most productive garden plants based on size-to-harvest ratio.

They don't want you to know ***how enjoyable it is to see little plants produce heaps of strawberries*** that you can immediately eat! There is no need to fight the crowds at the supermarket or grocery store to enjoy ultra-fresh berries.

And, my friend, you are now positioned to reap the myriads of benefits you'll realize by growing your own strawberries. You will be able to realize true value by using this, The Strawberry Growing Master Manual, to produce your own strawberries. To best understand this value, allow me to remind you about some of what makes strawberry plants so amazing...

- **Strawberry plants are SMALL.** They can fit just about *anywhere*. You can grow them in a window planter, flower pot on a deck, or just about anywhere you have a measly ½-square-foot of soil. Since most of the strawberry plant's roots are in the top 3 inches of soil, you don't even need a deep planter to succeed. In short, if you have a container and can scrape together some dirt, you can grow strawberries. A fully mature strawberry plant only takes up a foot of vertical space and a little more than a foot of horizontal space (usually).
- **Strawberry plants are ADAPTABLE.** Pipes, buckets, pots, neatly tilled rows, scattered random plantings in a permaculture landscape, old tires, it doesn't matter. Strawberries will grow in virtually any container or system as long as the appropriate nutrients and sunlight are available.
- **Strawberry plants are BIG PRODUCERS.** You'd think a plant with no woody tissue would be limited in what it can produce. In a sense, that is true. Comparing strawberries to oak trees or apple trees would be laughable. But, despite being all leaves and flexible stems, strawberry plants will produce *about a quart* of strawberries *each*. The production of strawberries a plant yields can even weigh more than the entire plant itself!
- **Strawberry plants are PERENNIAL.** That means they live for years without having to re-plant them. They go dormant during winter and burst forth again with renewed vigor the following year. Unlike squash, tomatoes, and other common garden plants, the same strawberry plant will give you strawberries year after year for several years. Plant once, harvest for 3-4 years!
- **Strawberry plants give a HUGE RETURN ON INVESTMENT.** You can buy 25 strawberry plants for around than \$10. But, they are propagation machines. A single strawberry plant will send out vine-like runners that will "plant" a handful of strawberry plants identical to the original. These can be moved and planted elsewhere to expand your strawberry bed to whatever size you wish it to be. 10 or 25 plants can become 100 or even 1000 before you know it! There is literally no end to the number of plants and strawberries you can multiply with a single one-time purchase of plants. If you could get that kind of return on an investment in the stock market, you'd be able to buy your own island somewhere.

Not only will The Strawberry Growing Master Manual help you harness every single one of these inherent strawberry plant benefits, there are other significant reasons to grow your own fruit in the comfort and convenience of your back yard or garden plot as well. For example...

Better Taste:

Commercial strawberry growing operations exist to turn a profit. There's nothing wrong with that, of course. It is what all businesses do. But, in order to maximize their profits, they generally select strawberry plant varieties that produce durable, shippable strawberries in high numbers. They often have decent flavor, but your own strawberries usually taste noticeably better. You can choose to grow strawberries that will perform better where you live without worrying about them getting smashed to pulp in an 18-wheeler truck on the interstate. The Strawberry Growing Master Manual will help you pick the perfect variety for where you live.

Much Less Expensive:

When you buy that package of strawberries at the grocery store, the price of growing, packaging, harvesting, shipping, and stocking is already included with each middleman taking their cut off the top. That means you end up having to shell out \$5 to \$10 per package of berries, and even more if they are organic or specialty. *One package* costs that much! The Strawberry Growing Master Manual will help you turn a one-time purchase into a quantity of strawberries that could be worth hundreds or even thousands of dollars! That is value!

Longer Shelf Life:

Strawberries are soft fruits. As mentioned above, the Big Boys have to choose varieties that will stand up to shipping in order to profit financially. Without a hard exterior, strawberries succumb easily to mold and other processes of decay. If an average strawberry has a shelf life of two weeks, they can have a week *or less* of shelf life left by the time you get them home from the store. The Strawberry Growing Master Manual will help you grow big berries that can be picked at the peak of ripeness and last until you have a moment to use them. No more lost money as the rest of the strawberries are tossed into the compost pile. No more being held hostage by moldering strawberries!

Less Waste:

Ever find a truly funky-looking strawberry in your store-bought package? I haven't. But I have seen scores of them growing from my plants. Even though most oddly-shaped or small berries are perfectly good to eat, they are culled by the commercial operations. By growing your own strawberries, you get to savor the flavor of every strawberry your plants produce, regardless if they are dwarf strawberries or deformed! Aesthetics and quality control policies cull out less-than-perfect-looking fruits before they ever get to the store. But, those fruits taste just as good as their more lovely brothers and sisters. By growing your own strawberries with The Strawberry Growing Master Manual, you'll get to consume 100% of your harvest. No waste. No discrimination against the more homely strawberry fruits...just efficient eating of all edibles.

Cleaner Produce:

Technology is a wonderful thing, but it often comes with a steep price. When it comes to strawberries, the commercial harvests are bigger than ever, thanks to chemical and technological applications. However, there may be a price to pay for bigger berries. Every year strawberries hold one of the top spots on the "Dirty Dozen" list. That list (put out annually by the Environmental Working Group) compiles testing data on numerous commonly grown and consumed fruits and vegetables. Conventionally-grown strawberries always rank high for chemicals and pesticide residues, things you probably do not want to consume. If you grow your own strawberries, you know exactly what you put on them and exactly what you are putting into your body. The Strawberry Growing Master Manual won't lead you into contamination with dangerous fumigants or other controversial chemicals. It will help you get the beautiful harvest to your table *cleanly*.

Still with me? Good. You are probably beginning to see the opportunity you have to turn a few small, adaptable, perennial, loved-yet-humble strawberry plants into an investment that returns heaps of better-tasting, longer-lasting, cleaner strawberries.

But, there are some tricks to the strawberry trade. If all you do is throw some plants into the ground and then return a few months later, you may have some strawberries (they are that productive!), but you won't get your money's worth out of them.

That is exactly why The Strawberry Growing Master Manual can help you. **YOU DON'T HAVE TO BE A MASTER GARDENER TO SUCCEED WITH STRAWBERRIES!** In fact, you don't even have to have ever planted anything ***at all***. All you have to be able to do is read and follow instructions. And, at this point, I think it is safe to say you have that covered. Most second-graders have that covered.

PICK THE TYPE OF STRAWBERRY RIGHT FOR YOU

Growing strawberries starts with selection of the type of strawberry that matches your goals and desires. There are three main types of strawberries available today: June-bearing, everbearing, and day-neutral. Some people consider everbearing and day-neutral varieties to be the same thing, but they are actually different. In short, June-bearers have the largest fruit but only produce one big crop over the course of a few weeks. Everbearers produce a larger early crop, smaller late crop, and a few berries in between, while day-neutrals produce throughout the growing season. Everbearers and day-neutrals typically produce less and smaller berries overall than do the June-bearing varieties.

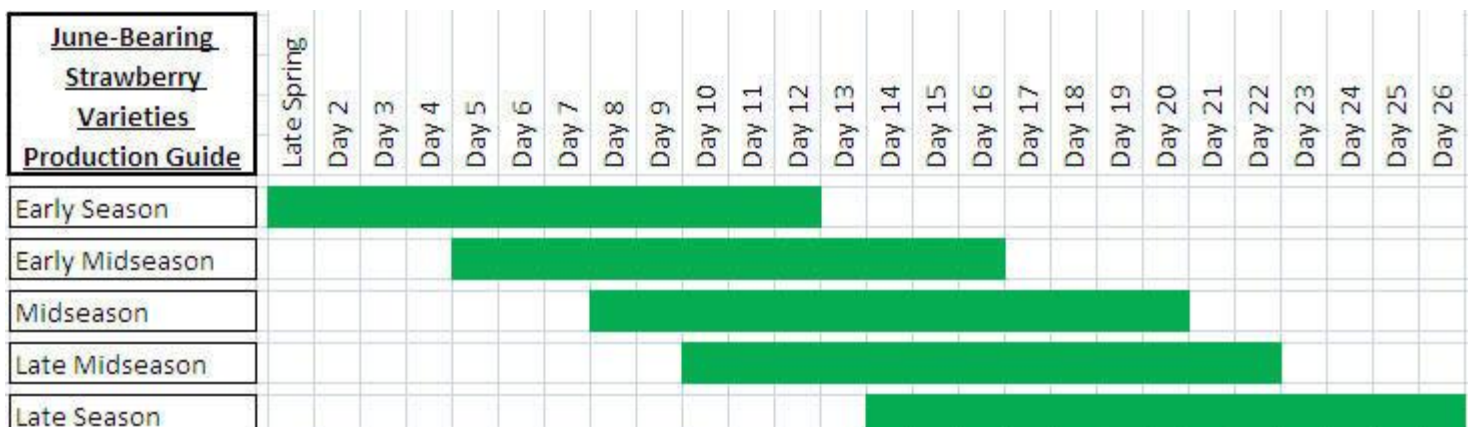
Considering the following characteristics of each of the three types will help you determine which type is right for you. If you want fresh berries throughout the year and don't mind picking smaller and fewer, go with a day-neutral or everbearing variety. If you want sheer quantity of berries, go with a June-bearer (what most people do).

Considerations on how you plan to use your strawberries also come into play when determining which type to buy and plant. If you want to can or preserve your harvest, it is easiest to accomplish your goals with the larger size and quantity that come from June-bearing strawberries.

June-bearing strawberry varieties:

Any list of strawberry varieties will probably contain more June-bearing strawberry varieties than any other. June-bearers are tremendously popular and common. They typically produce the largest strawberries, and do so over a period of two to three weeks, on average. Most June bearing strawberry varieties produce a harvest around the month of June, hence the name. However, June-bearing strawberry varieties are further classified into Early Season, Midseason, and Late Season. By selecting strawberry plant varieties that produce during different parts of the season, you can prolong your harvest and enjoy fresh strawberries for an extended period of time. June bearing strawberries are most often of the Garden Strawberry variety (*Fragaria x ananassa*). June bearing strawberry varieties are often planted using the matted row system (more on that later).

For reference, each of the June bearing strawberry types generally sets fruit for a total of 10 to 14 days. Early Season strawberry varieties usually begin fruiting in late spring. Early Midseason strawberry varieties begin fruiting about 5 days after Early Season varieties. Midseason strawberry varieties begin producing approximately 8 days after Early Season varieties. Late Midseason strawberry varieties begin fruiting about 10 days after Early Season varieties, and Late Season strawberry varieties begin their berry production about 14 days after the Early Season varieties.



Everbearing strawberry varieties:

Everbearing strawberry varieties aren't really "everbearing." They generally produce two harvests per year: one in the spring and another in the late summer or fall. Under ideal conditions, it is possible for some everbearing strawberry varieties to produce three berry harvests. In general, everbearing strawberry varieties put out less runners than the June bearing varieties, as most of the plants productive energy is directed toward producing multiple strawberry harvests. Everbearing strawberry varieties are often planted using the hill system or in locations where space is limited.

Day-neutral strawberry varieties:

Day neutral strawberry varieties are unique. Unlike June bearing varieties, day neutral strawberries will produce a good yield in the first year they are planted. They flower and set strawberries whenever the temperature is between 35 and 85 degrees. They will still be producing fruit in October during milder years. The drawback to day neutral strawberry plants is that they produce smaller strawberries than do the June bearing and everbearing strawberry varieties. Their fruit is usually small to medium in size, rarely exceeding one inch. Day neutral strawberry varieties are often planted using the hill system or in locations where space is limited. Hydroponic systems do best with day-neutral varieties, however.

Picking a Strawberry Plant Variety to Grow

Before you begin growing strawberries in your garden, you need to determine which variety of strawberry plant you want to grow. Every location is slightly different, and a variety that does well in California may not do so well in Maine or Florida.

One unifying factor to consider when picking a strawberry plant variety is susceptibility to *Verticillium* fungus. This fungus causes the most common strawberry disease, Verticillium wilt (or Verticillium rot), which will end fruit production by killing growing strawberries. Since there is no practical way to kill the fungus once infection sets in, this prevalent disease is best prevented by obtaining and planting strawberry plant varieties that are certified to be resistant to Verticillium wilt.

The following section will assist you in identifying strawberry varieties that are well-suited for your particular location. If you have a very unique situation or are completely at a loss for where to start, you can always call your local Cooperative Extension and ask them for recommendations. They are usually quite helpful. They can give you more specific information on which strawberries grow well in your area. As new and improved strawberry cultivars are also introduced each year, your Cooperative Extension can also clue you in to any new developments or local suppliers where you can find a good cultivar for your area.

Once you settle on growing a strawberry plant variety, you need to get your plants. There are numerous catalogs and nurseries from which you can buy certified, healthy plants. With the proliferation of online suppliers, getting specific strawberry plants to grow has never been easier! But, before you shop, you need to choose the proper variety for your location. So, keep on reading!

CHOOSE THE PROPER VARIETIES FOR YOUR LOCATION

As one might expect, there are a lot of different climates and growing conditions out there. Each of the United States and Canadian provinces/territories has its own unique general soil composition, rainfall, and weather patterns.

Consequently, any given strawberry plant variety is likely to do better in one specific region than other regions. While some cultivars are able to adapt in many environments, others have been bred to be highly productive in a relatively narrow climate range.



This guide is a location-by-location list of strawberry varieties that do well in each state. Once you find your state and a prospective variety for your own garden, you can check the availability of that variety at local nurseries in your area, or you can use the links (for varieties available for sale online) to compare prices at various online retailers, if you'd prefer to do so.

Recommended Strawberry Varieties by State

The states and the specific varieties recommended for growing in each one are listed in alphabetical order below. Simply scroll down to the appropriate state. If the variety is linked, clicking the link will take you directly to a list of nurseries or wholesalers who offer that particular variety for sale online (requires internet connection). The list for Canadian provinces and territories follows the list for the United States below.

ALABAMA

Recommended strawberry varieties for Alabama: Albritton, [Allstar](#), [Cardinal](#), [Chandler](#), Delite, Douglas, Earlibelle, [Earliglow](#), [Sunrise](#). (According to the Alabama Cooperative Extension Services of Alabama A&M and Auburn Universities)

ALASKA

Recommended strawberry varieties for Alaska: Brighton, [Fern](#), [Hecker](#), Irvine, Mrak, Muir, [Ogallala](#), [Ozark Beauty](#), [Quinault](#), Selva, Streamliner, Superfection, Tillicum, [Tribute](#), [Tristar](#), Yolo. (According to the University of Alaska Fairbanks Cooperative Extension Service)

ARIZONA

Recommended strawberry varieties for Arizona: [Camarosa](#), [Chandler](#). Note: Arizona is not considered a good location for strawberry cultivation. (According to the University of Arizona Citrus Agricultural Center)

ARKANSAS

Recommended strawberry varieties for Arkansas: [Cardinal](#), [Camarosa](#), [Chandler](#), Delmarvel, [Earliglow](#), [Lateglow](#), [Noreaster](#), [Sweet Charlie](#), [Tribute](#), [Tristar](#). (According to the University of Arkansas Department of Agriculture Cooperative Extension Service)

CALIFORNIA

Recommended strawberry varieties for California: [Albion](#), [Aromas](#), [Camarosa](#), [Camino Real](#), [Chandler](#), [Diamante](#), [Gaviota](#), Oso Grande, Pacific, [Seascape](#), Selva, [Ventana](#). (According to the California Strawberry Commission)

COLORADO

Recommended strawberry varieties for Colorado: Catskill, Empire, Fairfax, [Fort Laramie](#), Geneva, [Guardian](#), Marlate, [Ogallala](#), [Ozark Beauty](#), [Quinault](#), [Redchief](#), Red Rich, Redstar, [Robinson](#), Superfection, [Tribute](#). (Colorado State University Cooperative Extension Service)

CONNECTICUT

Recommended strawberry varieties for Connecticut: [Brunswick](#), [Cabot](#), [Clancy](#), [Darselect](#), [Earliglow](#), [Eros](#), [Honeoye](#), [Jewel](#), [L'Amour](#), [Sable](#). (According to the New England Vegetable and Fruit Conference)

DELAWARE

Recommended strawberry varieties for Delaware: [Allstar](#), Delite, [Earliglow](#), [Guardian](#), [Late Glow](#), [Red Chief](#), [Sparkle](#), [Tribute](#), [Tristar](#). (According to the University of Delaware College of Agriculture & Natural Resources Cooperative Extension)

FLORIDA

Recommended strawberry varieties for Florida: Calibrate, [Camarosa](#), Florida Belle, Florida 90, Rosa Linda, [Sequoia](#), [Sweet Charlie](#), [Strawberry Festival](#), [Tioga](#). (According to the University of Florida University Relations Department)

GEORGIA

Recommended strawberry varieties for Georgia: Apollo, Delite, [Cardinal](#), [Earliglow](#), [Sunrise](#), [Surecrop](#). (According to the University of Georgia College of Agricultural & Environmental Sciences)

HAWAII

Recommended strawberry varieties for Hawaii: [Eversweet](#), [Quinault](#), [Seascape](#). Although strawberries are grown commercially on the Islands, and the *Fragaria chiloensis* species of strawberries grow at elevation there, they are more difficult to grow in the tropical environment and not highly recommended. The three varieties listed are sold in nurseries on Hawaii.

IDAHO

Recommended strawberry varieties for Idaho: [Allstar](#), [Benton](#), Blomidon, Catskill, [Cavendish](#), [Earliglow](#), [Fort Laramie](#), [Glooscap](#), [Guardian](#), [Honeoye](#), [Jewel](#), [Lateglow](#), Lester, Micmac, [Quinault](#), [Redchief](#), Scott, [Shuksan](#), [Surecrop](#), [Totem](#), [Tribute](#), [Tristar](#). (According to the University of Idaho Extension Service)

ILLINOIS

Recommended strawberry varieties for Illinois: [Allstar](#), [Annapolis](#), Delmarvel, [Earliglow](#), [Honeoye](#), [Jewel](#), [Kent](#), [Seneca](#), [Tribute](#), [Tristar](#). (According to the University of Illinois Extension Service)

INDIANA

Recommended strawberry varieties for Indiana: Delite, [Earliglow](#), [Fort Laramie](#), [Guardian](#), [Sunrise](#), [Ozark Beauty](#), [Redchief](#), [Sparkle](#), [Surecrop](#). (According to the Purdue University Extension Service)

IOWA

Recommended strawberry varieties for Iowa: [Annapolis](#), [Cavendish](#), Delmarvel, [Honeoye](#), [Jewel](#), [Kent](#), [Mohawk](#), [Primetime](#), [Winona](#). (According to the Iowa State University Southeast Research and Demonstration Farm)

KANSAS

Recommended strawberry varieties for Kansas: [Allstar](#), [Earliglow](#), [Guardian](#), [Northeast](#), [Ogallala](#), [Ozark Beauty](#), [Primetime](#), [Redchief](#), [Tribute](#), [Tristar](#). (According to the Kansas State University Agricultural Experiment Station and Cooperative Extension Service's Horticultural Report)

KENTUCKY

Recommended strawberry varieties for Kentucky: [Camarosa](#), [Chandler](#), [Jewel](#), [Northeast](#), [Sweet Charlie](#). (According to the University of Kentucky Department of Horticulture and Landscape Architecture's Fruit and Vegetable Crops Research Report)

LOUISIANA

Recommended strawberry varieties for Louisiana: [Camarosa](#), [Camino Real](#), [Strawberry Festival](#). (According to the Louisiana State University AgCenter Research & Extension)

MAINE

Recommended strawberry varieties for Maine: [Allstar](#), Bounty, Catskill, [Earliglow](#), [Guardian](#), [Lateglow](#), Midway, [Mira](#), [Mohawk](#), [Northeast](#), [Surecrop](#). (According to the University of Maine Cooperative Extension Service)

MARYLAND

Recommended strawberry varieties for Maryland: [Allstar](#), Bish, [Chandler](#), [Darselect](#), [Eros](#), [Jewel](#), KRS-10, [Oviation](#), [Seascape](#). (According to the University of Maryland Agricultural Experiment Station). [Flavorfest](#) (recommended by Kim Lewers of the USDA's Agricultural Research Service)

MASSACHUSETTS

Recommended strawberry varieties for Massachusetts: Catskill, Earlidawn, Fletcher, [Guardian](#), Midway, Raritan, [Redchief](#), [Sparkle](#), [Surecrop](#). (According to farminfo.org)

MICHIGAN

Recommended strawberry varieties for Michigan: [Allstar](#), [Annapolis](#), Bounty, [Cavendish](#), [Chambly](#), Delmarvel, [Earliglow](#), [Glooscap](#), [Honeoye](#), [Jewel](#), [Redchief](#), [Tribute](#), [Tristar](#). (According to the Michigan State University Extension Van Buren County)

MINNESOTA

Recommended strawberry varieties for Minnesota: [Cavendish](#), [Kent](#), [Mesabi](#), [Winona](#). (According to the University of Minnesota Agricultural Experiment Station and Extension Service)

MISSISSIPPI

Recommended strawberry varieties for Mississippi: [Cardinal](#), [Chandler](#), Comet, Dixieland, Douglas, Florida 90, Pocahontas, [Sunrise](#), Tangi, [Tennessee Beauty](#). (According to the Mississippi State University Extension Service)

MISSOURI

Recommended strawberry varieties for Missouri: [Allstar](#), [Cardinal](#), [Earliglow](#), [Guardian](#), [Honeoye](#), [Jewel](#), [Lateglow](#), [Ogallala](#), [Ozark Beauty](#), [Redchief](#), [Sparkle](#), [Surecrop](#), [Tribute](#), [Tristar](#). (According to the University of Missouri Horticultural MU Guide)

MONTANA

Recommended strawberry varieties for Montana: Catskill, [Fern](#), [Fort Laramie](#), [Gem](#), [Glooscap](#), [Hecker](#), [Honeoye](#), [Ogallala](#), Red Rich, [Redcoat](#), [Senator Dunlap](#), [Sparkle](#), Streamliner, [Tribute](#), [Tristar](#), [Veestar](#), Vibrant. (According to the Montana State University Extension Service)

NEBRASKA

Recommended strawberry varieties for Nebraska: [Earliglow](#), [Ft. Laramie](#), [Ogallala](#), [Sunrise](#), [Surecrop](#), [Redchief](#), [Tribute](#), [Tristar](#). (According to the University of Nebraska Lincoln Extension in Lancaster County)

NEVADA

Recommended strawberry varieties for Nevada: [Camarosa](#), [Chandler](#). Note: Nevada is not considered a good location for strawberry traditional strawberry cultivation.

NEW HAMPSHIRE

Recommended strawberry varieties for New Hampshire: [Allstar](#), [Cavendish](#), Cornwallis, [Earliglow](#), [Redchief](#), [Sparkle](#). (According to the University of New Hampshire Cooperative Extension)

NEW JERSEY

Recommended strawberry varieties for New Jersey: Delmarvel, [Earliglow](#), [Guardian](#), Latestar, Lester, [Northeast](#), Raritan, [Redchief](#), [Sparkle](#), [Tribute](#), [Tristar](#). (According to the National Sustainable Agriculture Information Service)

NEW MEXICO

Recommended strawberry varieties for New Mexico: [Fern](#), [Fort Laramie](#), [Gem](#), [Guardian](#), [Ogallala](#), [Ozark Beauty](#), [Quinault](#), [Robinson](#), Selva, [Sequoia](#), Streamliner, Superfection, [Surecrop](#), [Tribute](#), [Tristar](#), Tufts. (According to the New Mexico State University Cooperative Extension Service and College of Agriculture and Home Economics)

NEW YORK

Recommended strawberry varieties for New York: [Allstar](#), Bounty, [Cavendish](#), Delite, [Earliglow](#), Fletcher, [Guardian](#), [Honeoye](#), [Jewel](#), [Kent](#), Raritan, [Redchief](#), Scott. (According to the Cornell Cooperative Extension Suffolk County)

NORTH CAROLINA

Recommended strawberry varieties for North Carolina: [Albion](#), Bish, [Camarosa](#), [Camino Real](#), [Chandler](#), [Gaviota](#), [Gem Star](#), Oso Grande, [Seascape](#), [Strawberry Festival](#), [Sweet Charlie](#), Treasure, [Ventana](#). (According to the North Carolina Strawberry Association)

NORTH DAKOTA

Recommended strawberry varieties for North Dakota: [Dunlap](#), [Ft. Laramie](#), [Gem](#), [Honeoye](#), [Redcoat](#), Stoplight, [Trumpeter](#). (According to the North Dakota State Agricultural and University Extension)

OHIO

Recommended strawberry varieties for Ohio: Delite, [Earliglow](#), [Guardian](#), [Kent](#), [Lateglow](#), Lester, Midway, [Redchief](#), [Surecrop](#), [Tribute](#), [Tristar](#). (According to the Ohio State University Extension)

OKLAHOMA

Recommended strawberry varieties for Oklahoma: Albritton , [Allstar](#), Apollo, Arking, [Blakemore](#), Canoga, [Cardinal](#), [Chandler](#), Delite, [Earliglow](#), Fletcher, [Guardian](#), Holiday, [Hood](#), [Lateglow](#), Luscious Lady, [Ozark Beauty](#), Scott, Spring Giant, [Sunrise](#), [Surecrop](#), [Tennessee Beauty](#), [Trumpeter](#). (According to the Oklahoma State University Cooperative Extension Service)

OREGON

Recommended strawberry varieties for Oregon: [Benton](#), [Fern](#), [Ft. Laramie](#), [Hecker](#), [Hood](#), Olympus, [Ozark Beauty](#), [Puget Reliance](#), [Quinault](#), [Rainier](#), Redcrest, Selva, [Shuksan](#), Sumas, Tillikum, [Tristar](#), [Totem](#). (According to the Oregon State University Extension Service)

PENNSYLVANIA

Recommended strawberry varieties for Pennsylvania: [Albion](#), [Allstar](#), [Camarosa](#), [Chandler](#), [Darselect](#), [Earliglow](#), [Everest](#), [Evie-2](#), [Honeoye](#), [Jewel](#), [L'Amour](#), [Seascape](#), [Sweet Charlie](#), [Tribute](#), [Tristar](#), [Wendy](#). (According to the Penn State University Small-scale and Part-time Farming Project)

RHODE ISLAND

Recommended strawberry varieties for Rhode Island: [Brunswick](#), [Cabot](#), [Clancy](#), [Darselect](#), [Earliglow](#), [Eros](#), [Honeoye](#), [Jewel](#), [L'Amour](#), [Sable](#). (According to the New England Vegetable and Fruit Conference)

SOUTH CAROLINA

Recommended strawberry varieties for South Carolina: Albritton, Apollo, [Cardinal](#), [Chandler](#), Delite, Douglas, [Earliglow](#), Florida 90, [Sunrise](#), [Surecrop](#), [Tioga](#). (According to the Clemson University Cooperative Extension Service)

SOUTH DAKOTA

Recommended strawberry varieties for South Dakota: [Annapolis](#), Bounty, Crimson King, [Earliglow](#), [Ft. Laramie](#), [Glooscap](#), [Honeoye](#), [Jewel](#), [Kent](#), [Ogallala](#), [Ozark Beauty](#), [Redcoat](#), Selva, [Seneca](#), Settler, [Sparkle](#), [Tribute](#), [Tristar](#), [Trumpeter](#), [Veestar](#). (According to the South Dakota State University Cooperative Extension Service)

TENNESSEE

Recommended strawberry varieties for Tennessee: [Allstar](#), [Cardinal](#), Delite, Delmarvel, [Earliglow](#), [Guardian](#), [Lateglow](#), [Red Chief](#), Scott, [Surecrop](#), [Tribute](#), [Tristar](#). (According to the Agricultural Extension Service of the University of Tennessee)

TEXAS

Recommended strawberry varieties for Texas: [Allstar](#), [Cardinal](#), [Chandler](#), Douglas, Pajaro, [Sequoia](#). (According to the Texas A&M System, Department of Horticultural Sciences, AgriLife Extension)

UTAH

Recommended strawberry varieties for Utah: [Allstar](#), [Chandler](#), [Earliglow](#), [Evie-2](#), [Honeoye](#), [Jewel](#), [Ogallala](#), [Seascape](#), [Sparkle](#), [Tribute](#). (According to the Utah State University Cooperative Extension)

VERMONT

Recommended strawberry varieties for Vermont: [Allstar](#), [Annapolis](#), [Brunswick](#), [Cabot](#), [Cavendish](#), [Clancey](#), Cornwallis, [Darselect](#), [Earliglow](#), [Everest](#), [Honeoye](#), [Jewel](#), [Kent](#), [L'Amour](#), [Lateglow](#), [Mesabi](#), Mic Mac, [Mira](#), [Mohawk](#), [Northeaster](#), [Sable](#), [Seascape](#), [Seneca](#), [Sparkle](#), [Tribute](#), [Tristar](#), [Veestar](#), [Winona](#). (According to the University of Vermont Extension)

VIRGINIA

Recommended strawberry varieties for Virginia: [Allstar](#), Delite, Delmarvel, [Earliglow](#), [Honeoye](#), [Lateglow](#), [Ozark Beauty](#), [Redchief](#), [Sunrise](#), [Surecrop](#), [Tribute](#), [Tristar](#). (According to the Virginia Cooperative Extension)

WASHINGTON

Recommended strawberry varieties for Washington: [Hood](#), Nanaimo, [Puget Reliance](#), [Quinault](#), [Rainier](#), Selva, [Shuksan](#), Tillicum, [Totem](#), [Tribute](#), [Tristar](#). (According to the Washington State University Extension)

WEST VIRGINIA

Recommended strawberry varieties for West Virginia: [Allstar](#), [Annapolis](#), [Earliglow](#), [Sable](#), [Seneca](#), [Surecrop](#). (According to the West Virginia University Extension Service)

WISCONSIN

Recommended strawberry varieties for Wisconsin: [Annapolis](#), [Cavendish](#), [Crimson Fern](#), [Fort Laramie](#), King, [Earliglow](#), [Glooscap](#), [Honeoye](#), [Jewel](#), [Kent](#), [Lateglow](#), Lester, [Mesabi](#), [Mira](#), [Ogallala](#), [Ozark Beauty](#), Raritan, [Redchief](#), [Seascape](#), Selva, [Seneca](#), [Sparkle](#), [Tribute](#), [Tristar](#), [Winona](#). (According to the Cooperative Extension System of the University of Wisconsin)

WYOMING

Recommended strawberry varieties for Wyoming: [Dunlap](#), [Fort Laramie](#), [Guardian](#), [Honeoye](#), [Ogallala](#), [Ozark Beauty](#), [Quinault](#), [Redcoat](#), [Surecrop](#), [Tribute](#), [Tristar](#), [Trumpeter](#). (According to the University of Wyoming College of Agriculture)

Recommended Strawberry Varieties for Canada

Strawberry plants are, in my humble opinion, a truly fascinating marvel of nature. They are amazingly adaptable; they propagate themselves in a plurality of ways; and they produce a fleshy red, white, yellow, or purple fruit that is universally prized by the intelligent and instinctive creatures that live all around us (as well as us human folk!). They have developed and adapted means of surviving sub-zero temperatures, and, consequently, can be grown from the warmer temperate regions of our great planet all the way north or south to the frigid regions.

But, their adaptability and genetic flexibility have allowed for selective breeding. Researchers have been able to breed for desired characteristics. And, while such breeding programs have allowed for improved disease resistance, bigger strawberries, different colors, and more commercially-viable cultivars, the breeding has also culled some of the hardiness from some of the varieties as specificity has narrowed by region. Today, not just any strawberry variety will do well in just any ol' location. The more extreme the weather, the more specific one should be when selecting a specialized variety for planting in order to obtain the best harvest from your efforts.

These are the recommended varieties for each territory or province in Canada, listed alphabetically:

ALBERTA

Appropriate Alberta strawberry varieties as recommended by Alberta Agriculture and Rural Development:
June-bearing: Bounty, Cavendish, Glooscap, Honeoye, Kent;



Everbearing: Fort Laramie, Ogallala;
Day-neutral: Albion, Fern, Seascape, Tristar.

BRITISH COLUMBIA

Appropriate British Columbia strawberry varieties as recommended by the British Columbia Ministry of Agriculture; Pacific Agri-Food Research Centre, Agriculture and Agri-Food Canada:

June-bearing: Clancy, Hood, Honeoye, Nisgaa (BC 92-20-85), Puget Crimson (WSU 2833), Puget Reliance, Rainier, Shuksan, Stolo (BC 96-33-4), Sweet Bliss (Orus 2180-1), Totem, Valley Red (ORUS 1790-1);

Day-neutral: Albion, Diamante, Monterey, San Andreas, Seascape, Selva.

Good strawberry varieties for British Columbia according to the Fraser Valley Strawberry Growers Association:

June-bearing: Charm, ORUS 2427-4, Puget Crimson, Sweet Bliss, Sweet Sunrise, Valley Red.

MANITOBA

Appropriate Manitoba strawberry varieties as recommended by Manitoba Agriculture, Food and Rural Initiatives Crops Knowledge Centre:

June-bearing: Kent, Glooscap;

Day-neutral: Seascape;

Everbearing: Fort Laramie, Ogallala.

NEW BRUNSWICK

Appropriate New Brunswick strawberry varieties as recommended by the New Brunswick Department of Agriculture, Aquaculture and Fisheries:

June-bearing: Annapolis (early), Blomidon (mid-to-late), Bounty (late), Cavendish (midseason), Glooscap (midseason), Kent (midseason), Veestar (early).

NEWFOUNDLAND AND LABRADOR

Appropriate Newfoundland and Labrador strawberry varieties as recommended by StrawberryPlants.org:

June-bearing: Cavendish, Glooscap, Kent;

Day-neutral: Seascape, Tristar;

Everbearing: Fort Laramie, Ogallala.

NORTHWEST TERRITORIES

Appropriate Northwest Territories strawberry varieties as recommended by the Northwest Territories Territorial Farmers Association:

Any [Alpine](#) strawberry variety (*Fragaria vesca* species).

NOVA SCOTIA

Appropriate Nova Scotia strawberry varieties as recommended by Atlantic Food and Horticulture Research Centre in Kentville; Horticulture Nova Scotia:

June-bearing: Annapolis, Kent, Mira, Sable.

NUNAVUT

Appropriate Nunavut strawberry varieties as recommended by StrawberryPlants.org:

June-bearing: Cavendish, Kent;

Day-neutral: Seascape, Tristar.

ONTARIO

Appropriate Ontario strawberry varieties as recommended by the Ontario Ministry of Agriculture and Food:

Early to early mid-season June-bearing: Annapolis, Brunswick, Darselect, Evangeline, Glooscap, Honeoye, Itasca, Mohawk, Sable, V151, Veestar, Wendy;

Mid-season to Late mid-season: Allstar, Cabot, Cavendish, Governor Simcoe, Jewel, Kent, L'Amour, Mira, Sapphire;

Late season: L'Authentique Orleans, Serenity, St. Pierre, R14, Valley Sunset;

Day-neutral: Albion, Evie 2, Seascape.

PRINCE EDWARD ISLAND

Appropriate Prince Edward Island strawberry varieties as recommended by the Prince Edward Island Department of Agriculture and Forestry:

June-bearing: AC Valley Sunset, Cabot, Glooscap, Jewel, Mira, Orleans, St. Laurent.

QUEBEC

Appropriate Quebec strawberry varieties as recommended by the Agriculture and Agri-Food Canada (AAFC) sub-station in L'Acadie:

June-bearing: Annapolis, Chambly, Harmonie, Honeoye, Kent, La Clé des Champs, Mira, Saint Laurent, Saint-Pierre, Yamaska;

Day-neutral: Albion.

Good strawberry varieties for Quebec according to the Lareault Nursery:

June-bearing: Annapolis, Bounty, Cabot, Cavendish, Chambly, Clé des Champs, Évangéline, Flavorfest, Glooscap, Harmonie, Harriot, Honeoye, Jewel, Kent, Lila, Mira, Sable, St-Jean d'Orléans, St-Pierre, Serenity, Sparkle, Summer Dawn, Summer Rose, Summer Ruby, Valley Sunset, Veestar, Wendy;

Day-neutral: Albion, Charlotte, Mara des bois, Monterey, Seascape.

SASKATCHEWAN

Appropriate Saskatchewan strawberry varieties as recommended by the University of Saskatchewan Fruit Program:

June-bearing: Annapolis, Bounty, Cavendish, Kent;

Day-neutral: Fern, Seascape, Tristar;

Everbearing: Fort Laramie, Ogallala.

YUKON

Appropriate Yukon strawberry varieties as recommended by Yukon Agriculture Research & Demonstration:

June-bearing: Cavendish, Kent.

DETERMINE THE CORRECT QUANTITY OF PLANTS YOU NEED

Part of learning how to grow strawberries is picking the right number of plants to begin your patch. Thinking through your goals and planned uses for your berries will guide your ordering/buying. If you buy too many, you might be overwhelmed. If you buy too few, you might be frustrated with the lack of berries when you need them. Before you order, be sure to think about and study up on what you are going to need. The following information should give you the details you need to determine the correct quantity of plants to order.

How Many Strawberry Plants Per Person?

Strawberries are a wonderful treat and, in my humble opinion, should be a permanent fixture in everyone's garden. It can be difficult to predict how many strawberry plants to order when planting for more than one person, however. The following guidelines should be helpful.

First, each strawberry plant will typically produce about a quart of strawberries per year. Varieties like Ozark Beauty (an everbearer) will produce two main crops and a few scattered berries throughout the year. When added together, they will usually total about a quart of total production. Varieties like Tribute and Tristar (day-neutrals) will produce scattered berries throughout the growing season, sometimes up until the first frost. Their berries are usually a bit smaller, but they can also produce up to a quart in the right environment. Finally, the most popular varieties are usually June-bearers that produce one major crop of larger berries, usually totaling a quart or more of total production.

Generally speaking, however, for fresh consumption only, a minimum of 6 to 7 plants per person would be required. 30 to 35 well-cared-for strawberry plants should feed a family of five. If you plan on freezing strawberries or canning them, 50 to 60 strawberry plants would be more advisable – at least 10 plants per person. These numbers are the minimum. Should you and yours be voracious strawberry eaters, it is a good idea to increase the number of strawberry plants per person to at least 10 for fresh eating and 100 or more for preserving for year-round consumption.

How Many Strawberries Do Strawberry Plants Produce?

Another way to look at the question is to consider how many strawberries an individual plant can reasonably be expected to produce. If conditions are appropriate, soil and water requirements are adequately met, and weed, pests, and pathogens are effectively controlled, a fairly reliable harvest can be expected.

The three types of strawberry plants each produce different expected amounts of fruit. The following is a brief reference so that the anticipated harvest can be put to good use when it comes in. Be sure to plant enough plants to reap the rewards you seek!



Each strawberry plant will produce a slightly varied weight of mature, ripe strawberries. Thousands of variables affect the production of each strawberry plant. The following is the normal expected strawberry production in pounds per foot of planted row. So, if you had two rows of strawberry plants that were 5 feet long each, the numbers below would be multiplied by 10 to get the total expected strawberry production for that strawberry patch.

June Bearing Strawberry Production

In the matted row system or the ribbon row system, the expected harvest should be between .5 and 1.5 pounds of strawberries per foot of row for June-bearing varieties during both the second and third years of life.

Everbearing Strawberry Production

In the matted row system or the ribbon row system, the expected harvest should be between .25 and .5 pounds of strawberries per foot of row for everbearing varieties during both the second and third years of life.

Day-Neutral Strawberry Production

In the matted row system or the ribbon row system, the expected harvest should be between .25 and .75 pounds of strawberries per foot of row for everbearing varieties during the first year of life. The expected harvest increases to between .5 and 1.5 pounds per foot of row for years 2 and 3.

Strawberry Plants Per Acre

If you are thinking about expanding a small strawberry patch into a huge one, cost calculations are critical. Most strawberry farms fail due to the farmer's lack of economic knowledge, not their lack of farming knowledge. One of the basic questions that must be answered when considering the numbers is how many strawberry plants per acre should be planted.



Generally, a new strawberry farm should start small. Calculating the number of strawberry plants per acre is much easier and less risky when the farmer doesn't jump in with both boots. The first planting for a newbie berry farmer should be around 1/2 acre to 1 acre of planted strawberries. This allows the budding strawberry business to grow as the farmer learns (without suffering a bankrupting loss if the learning is through the school of hard knocks).

The tried and true system for perennial commercial matted row strawberry production encourages rows spaced 4 feet apart with strawberry plants planted 24 inches (2 feet) apart in the rows. This system will require a little less than 5,500 strawberry plants per acre to be planted. There are, however, other spacing options and systems that can be used. For handy reference, see the table below.

Table of Strawberry Plants Per Acre Based on Spacing

Row Spacing	Plant Spacing within Rows	Strawberry Plants Per Acre
48"	24"	5,445
48"	18"	7,260
48"	12"	10,890
42"	24"	6,222
42"	18"	8,297
42"	12"	12,445
36"	24"	7,260
36"	18"	9,680
36"	12"	14,520

WILL YOU GROW FROM PLANTS OR FROM SEEDS?

Once you have decided to begin growing strawberries, you need to pick your starting point. You can grow strawberries from seeds, or you can opt to transplant or purchase strawberry plants for your garden.

It is more difficult and requires more patience if you start with strawberry seeds instead of existing strawberry plants. There is a somewhat delicate process of sprouting strawberry seeds as is covered below, while ordering or otherwise acquiring dormant or active strawberry plants to re-plant is found to be quicker and easier by most people. Regardless of which method you choose, help is below in later sections.

Growing Strawberries from a Strawberry Plant

Whether you start with seed or plant, successful fruit production comes from successfully growing strawberry plants. The major benefit of starting with bare-root or potted plants is this: you get fruit faster. That is why you are growing strawberries in the first place, right?! When you start with already-developed plants, a lot of plant development and growth has already occurred under the watchful eye of whichever nursery or supplier provided your plants to you.

You don't have to worry about damaging the tiny seedlings, you don't have to re-pot into bigger pots as the seedlings grow, and you have less time for mean pathogens or parasites to find your succulent little plant and decide it looks like a good meal. In short, planting already-developed plants is the safest and quickest way to a huge haul of strawberries. Consequently, it is also the way most gardeners go when determining how to initiate their strawberry bed.

Growing Strawberry Plants from Strawberry Seeds

As mentioned just above, growing strawberry plants from seed is more difficult than simply buying strawberry plants. But, it can be much more rewarding as well. If you are a true green thumb, much satisfaction can be derived from unlocking the potential contained in a tiny strawberry seed (and they are tiny!), seeing the tiny seedling take root with its itty-bitty leaflets, and then watching the sustaining roots take hold and support the developing crown so that the plant really starts to grow exponentially.

Another drawback from growing strawberries from seed is that the vast majority of strawberry varieties available are of the *Fragaria x ananassa* hybrid variety. And, unfortunately, those varieties will NOT grow true from seed. Only true species will grow true from seed, and the true species have, on average, much smaller harvests of much smaller strawberries. So, if you grow from seed, you'll likely have fewer and smaller strawberries.

BUY YOUR PLANTS OR SEEDS

Once you have settled on the type, variety, and quantity of strawberry plants that will work best for you, all that is left is to get the best possible deal on plants. If you have access to the internet, you can shop from suppliers all over the country from one easy directory. Remember, there are many more plants available than seeds since hybrid seeds won't grow true. You can use these directories to shop online:

[Buy Strawberry Plants](#)

[Buy Strawberry Seeds](#)

Check the prices on each of your desired varieties and then order from whichever offers you the best deal! If you'd rather buy from a bricks-and-mortar establishment or nursery, you can, of course, do that as well. Most of the big-box retailers like Lowes and Home Depot and even the garden centers of most Wal-Marts will have several different popular varieties of potted strawberry plants available each spring. For specialty strawberries, you may want to call your local nurseries prior to planting season to check availability.

WHEN TO PLANT YOUR STRAWBERRIES

Whether you buy them at the store or order them online, as soon as you get the strawberry plants to your garden, get them in the ground as quickly as possible.

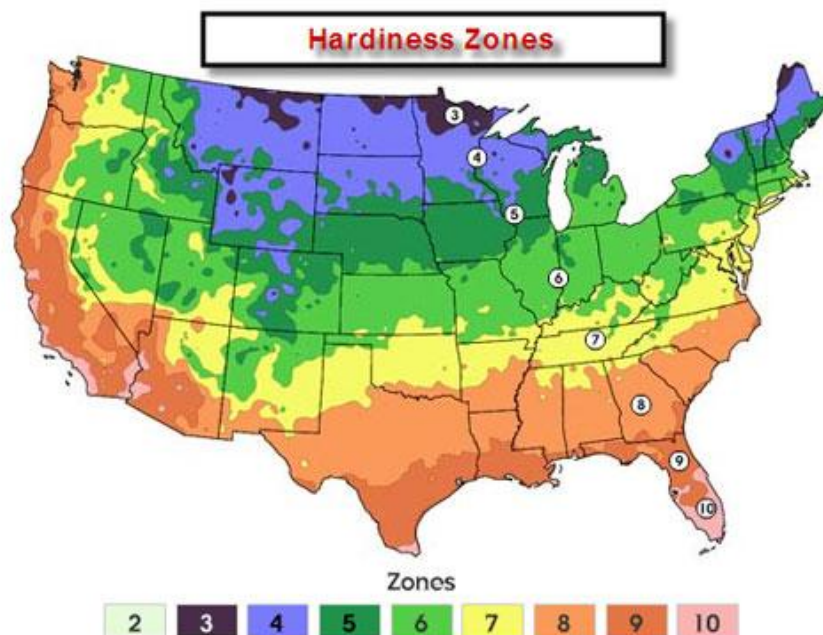
The time of year is a consideration in planting strawberries as well. Most gardeners plant strawberries when the weather is warming up in the spring and Garden Fever is contagious. That is fine, of course, but planting in the fall has its benefits. I will cover those later, but let me discuss spring planting first since it is most popular!

Strawberry Planting Guide: When to Plant Spring Strawberry Plants

Spring brings forth visions of harvest in the minds of home gardeners everywhere as they look at freshly planted gardens. As most gardeners know, everything does best when planted at its optimal time. Planting strawberries is no different. This strawberry planting guide will show you when you should put your strawberry plants in the ground according to the U.S. agricultural zones:

The following table lists the date ranges when you should plant strawberries according to USDA zones. The higher the number, the closer the zone is to the equator. Each zone has unique climactic properties, and following this strawberry planting schedule will help you maximize your harvest

USDA Agricultural Zone	Plant Strawberries From:	Plant Strawberries Until:
Zone 10	December	February
Zone 9	December	February
Zone 8	December	Middle of March
Zone 7	December	Early April
Zone 6	Early March	Middle of April
Zone 5	Early April	Early May
Zone 4	Early May	Middle of May
Zone 3	Early May	Middle of May



It is important to remember that planting strawberries during the appropriate time window is only half the battle, and late frosts generally won't do any significant damage to strawberry plants, although early strawberry blooms may be damaged. It is also important to select a cultivar that is well suited for your area.

Fall Strawberry Plants

Planting strawberry plants in the fall is a good idea. However, most home gardeners get excited about their gardens toward the end of the winter months and don't plan far enough ahead to plant strawberries during the autumn months of the previous year.



There are two main consequences of this widespread pattern:

1. Most home gardeners miss out on a healthy crop of strawberries during the first year (growing season) they are planted.
2. It is harder to find strawberry plants for sale in the fall months simply due to supply and demand. Demand is much less, so supply is much less.

For the best possible results, it is a good idea to plant strawberry plants in the fall so that they can reap a healthy harvest of strawberries during the gardening season the following spring/summer.

Fall Planting of Strawberry Plants : Info

Planting strawberries in the fall makes much sense. It makes so much sense that commercial strawberry farms almost exclusively plant strawberry plants during the fall months after they have harvested the previous year's strawberries. If you plant in the spring (as most hobby gardeners do), much more care is required and much more time passes from the time the strawberry plants are planted until a full harvest is reaped.

By planting a strawberry bed in the fall months, the strawberry plants are able to fully establish themselves and their root system prior to going dormant for the winter. Then, as the temperatures rise in the late winter or early spring months, a fully-rooted and more mature plant begins to put forth new foliage and flower stalks. Instead of pinching off the strawberry flowers so that the roots can establish, the already-established roots pull water and nutrients from the soil to support the growing strawberries. This allows a healthy harvest during the first growing season instead of the second!

Additionally, many mail order nurseries will ship strawberry plugs with intact roots for fall planting instead of dormant bare-root plants. This helps the plants establish more quickly than bare-root plants and helps minimize the number of plants that die (more plugs survive than do shipped and planted bare-root plants).

Hopefully, those strawberry gardeners with an inclination toward planning will realize the benefits of planting fall strawberry plants.

Remember, plant inventories are usually a bit transient as plant stock is sold out and replenished or replaced with other, better-selling varieties. Planning ahead and planting ahead can make a tremendous difference with the quality and quantity of your first strawberry harvest. Why not consider buying and planting some fall strawberry plants instead of waiting until the spring?!

GERMANATING STRAWBERRY SEEDS

Growing strawberries from seed, of course, begins with selection of your preferred strawberry varieties. Once you have selected the strawberry cultivar that is right for your garden and purchased the strawberry seeds, you are ready to plant. Be aware, however, that strawberry seeds from most hybrid cultivars will not reproduce true to form. Alpine varieties and heirloom seeds usually will (along with a few of the newer F1 cultivars), so factor that in when planting strawberry seeds.

While the verdict is out on whether it is absolutely necessary to subject strawberry seeds to a period of cold prior to attempting to germinate, most people agree that many varieties of strawberry seeds need to be cold treated to encourage germination. If your selected strawberry seeds require this, fear not. It is easy. Simply wrap your strawberry seeds, put them in an airtight container, and place them in a freezer. This simulates winter conditions, and the warming period lets the seed know it is time to come to life. After keeping the strawberry seeds below freezing for two to four weeks, remove the seeds from the freezer. Leave them in the jar or container as they gradually warm up to room temperature.

Once your strawberry seeds are at room temperature and are ready plant, you need to create a hospitable place for your strawberry seeds to begin their journey to planthood. A seed tray works well. Obtain a seed tray and prepare it. A good mix for starting strawberry seeds is 3 parts peat to 1 part organic-rich soil. Spread this out in your seed tray to a depth of about one half of an inch.

Moisten the mixture with water until it is uniformly damp. Sprinkle your strawberry seeds over the damp mixture and then cover the seeds with a very thin dusting of peat moss. Ensure that the strawberry seeds are not completely covered and are exposed to light. Keep them indoors in a well-lighted room and in direct sunlight, if possible. In two to three weeks, the strawberry seeds should germinate.

Keep the soil moist well-lighted. Warmth can help the seeds germinate, so the top of a refrigerator or on a bottom heat pad can be suitable places for germination. If the strawberry plant seedlings aren't in direct sunlight with supplemental light, consider providing additional artificial light. A fluorescent shop light or grow light will do the trick. Position the light source 3 to 4 inches from the seedlings, and raise the light as the strawberry plants grow. If the strawberry seeds sprout too close to each other, thin them when they are between 1 and 2 inches tall, keeping the biggest and most vigorous seedlings. Gently transfer the strawberry seedlings to larger containers or pots after they gain their 3rd leaves.

If weather allows, the strawberry seedlings can be planted directly outside, or the plants in the containers can be replanted outside. If the strawberry seeds were started indoors, the young strawberry plants need to be hardened off prior to planting outside. When the temperature rises into the 50s, begin taking the plants outside in the shade for several hours each day. Gradually increase the time the plants are outdoors, eventually leaving them outside overnight as the temperature allows. Begin moving them into the sun for increasing periods of time to finish the hardening off process prior to planting. This ensures your plants won't be damaged or killed by their environmental changes.

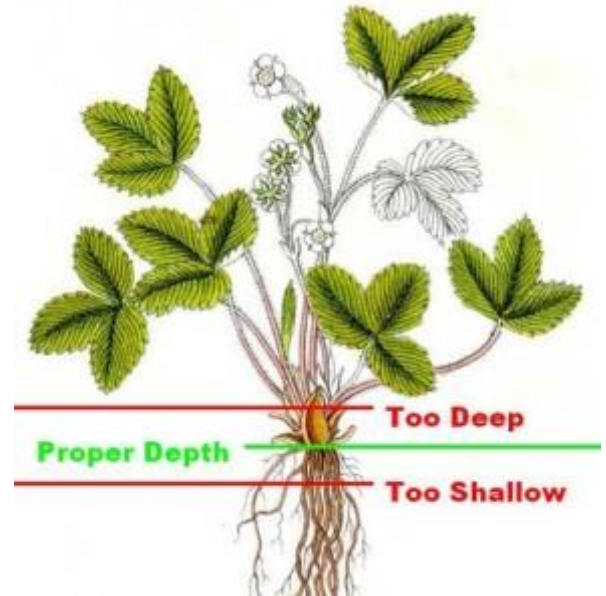
It is fun to grow strawberries from seed, and the process is rewarding, even though it takes longer to realize your first harvest!

HOW TO PLANT YOUR STRAWBERRIES

Strawberry plants have a thick section of tissue called the “crown” between the stems and roots. Your plants should be planted so that the crown is even with the soil. Plant them too high, and the roots dry out. Plant them too low or completely bury the crown under the soil, and your plants will be much more likely to suffer injury or disease.

Learning how and when to properly plant strawberries is an important step in learning how to grow strawberries. Fortunately, it is fairly easy! For spring planting, you should plant your strawberries as soon as the soil is dry and able to be worked (usually March or April). The plants need to be well-established before the temperatures rise in the summer months. When you are ready, loosen and pulverize the dirt down six to eight inches, and keep it loose to allow runners to take hold and roots to establish.

You should have disease-free, healthy plants or seedlings ready to plant. If picking them yourself, choose plants that have large crowns with healthy, light-colored roots. If you ordered them, open the package immediately and inspect them. If moldy, send the strawberry plants directly back. If you can't plant them immediately, wrap the strawberry plants in wet paper towels, put them in a bag, and store them in your refrigerator until you can plant strawberry plants outside. Planting strawberry plants should be done on a cloudy or overcast day or during the late afternoon.



The specifics: dig out a hole big enough to spread out the roots of each strawberry plant. In the bottom of the hole, create a mound or hill of soil that is flush with the surrounding soil level. Put the strawberry plant on top of the hill inside the hole so that the crown is at soil level and spread the roots out down the sides of the hill. Fill in the hole and ensure that the soil level is even with the middle of the crown. Planting too shallow may cause the roots to dry out before they establish, and planting too deep can also damage growing strawberries. See the figure just above for proper crown placement. Once the plants are planted, press to firm the soil around the roots and then water thoroughly.

There are two main scenarios gardeners typically encounter when deciding to order plants. They either obtain plants that are actively growing (either in pots or as plug plants), or they buy dormant bare root strawberries. The potted plants usually have a head start on the dormant plants and will grow more quickly, but they are typically significantly more expensive. For the same price as two or three potted plants, one can often obtain 20-25 bare root plants. Plug plants are in the middle of the cost spectrum, but they are still usually more expensive than the bare root strawberries. Planting each is slightly different.

With plants potted in cardboard-like biodegradable pots, water the plants thoroughly before planting so that the biodegradable pot is soaked through. Then, tear off the rim and bottom of the plant, leaving only the middle section intact and exposing the roots. Locate the crown and place the plant into a pre-dug hole so that the crown is level with the soil (not above or below as discussed above) and exposed to light and fresh air. Repack the dirt around the newly planted strawberry plant and repeat for all the others you have. Once planted, water well and surround with clean straw mulch.

For plug plants, simply remove each plant from its container gently. Then plant as-is, keeping the crown level with the soil. Water well and mulch with clean straw mulch.

For bare-root plants, a little prep work is in order. When you receive your bare-root plants, remove them from the packaging first. Trim the roots to 6 or 8 inches with clean scissors or shears if they are longer than that. Next, place them into a bowl of water to soak the roots. Allow them to soak for 10-15 minutes, then plant them so that their crowns are at soil level. Firm the soil around the roots to remove air pockets. Then, water well and mulch with clean straw.

SITE SELECTION

Choosing an area conducive to growing strawberries is a critical step in learning how to grow strawberries. There are several factors that need to be considered when selecting a site for your strawberry garden.

First, strawberries love sunlight and need full sun to produce the largest yields. While harvestable berries will be produced with as little as six hours of direct sun a day, it is best to select a site that is clear of other tall or shadow-casting trees or plants. Planting strawberries away from large trees is important so that the tree root system doesn't compete with and siphon away needed moisture from the growing strawberry plants.

Second, there are several soil issues that should be addressed. While they are able to be grown in most soil conditions, strawberries prefer a loose, sandy loam that is deep and contains very high amounts of organic matter. Extra compost, peat moss, and some sand or grit can be added to your selected site to create the best environment for growing strawberries. Potting soils usually have sufficient compositions if you are planning on planting strawberries in a container. In that case, add an extra inch or two of fresh compost to the surface of the potting mix.

The history of the dirt patch is also important to your success in growing strawberries. If other *Verticillium*-susceptible crops have been grown in the same area during the last three years, it is best to choose a different site. The most common of these plants are tomatoes, potatoes, eggplant, peppers, and strawberries. If these plants (or melons, okra, mint, bush or bramble fruits, stone fruits, chrysanthemums, and roses) have been grown in the same spot recently (within 5 years), it is best to grow your strawberry plants elsewhere.

Third, it is important to pick a site that has good soil drainage and surface drainage. Although strawberry plants need constant moisture to thrive, the plants will rot if left in standing water due to poor site drainage. If you only have access to a site that has poor drainage or heavy soils, constructing a raised bed for the strawberry plants should facilitate better drainage. The strawberry bed should be elevated, at minimum, six to eight inches. Also, make sure there are drainage holes in the bottom if you are using container gardening methods.

Strawberries do not perform well in drought conditions either. Therefore, be sure to select a site that will allow easy access so that your strawberry plants can be watered if rainfall is not adequate.

CHOOSING YOUR GROWING METHOD

When growing strawberries, it is important to keep in mind that they are traditionally grown as perennials. So, even though some varieties can be grown as annuals in the hotter parts of the south, better results are usually obtained when the strawberry plants are planted in one year and nurtured for bigger yields in subsequent years. Various planting systems are used for growing strawberries depending on which type you plant.

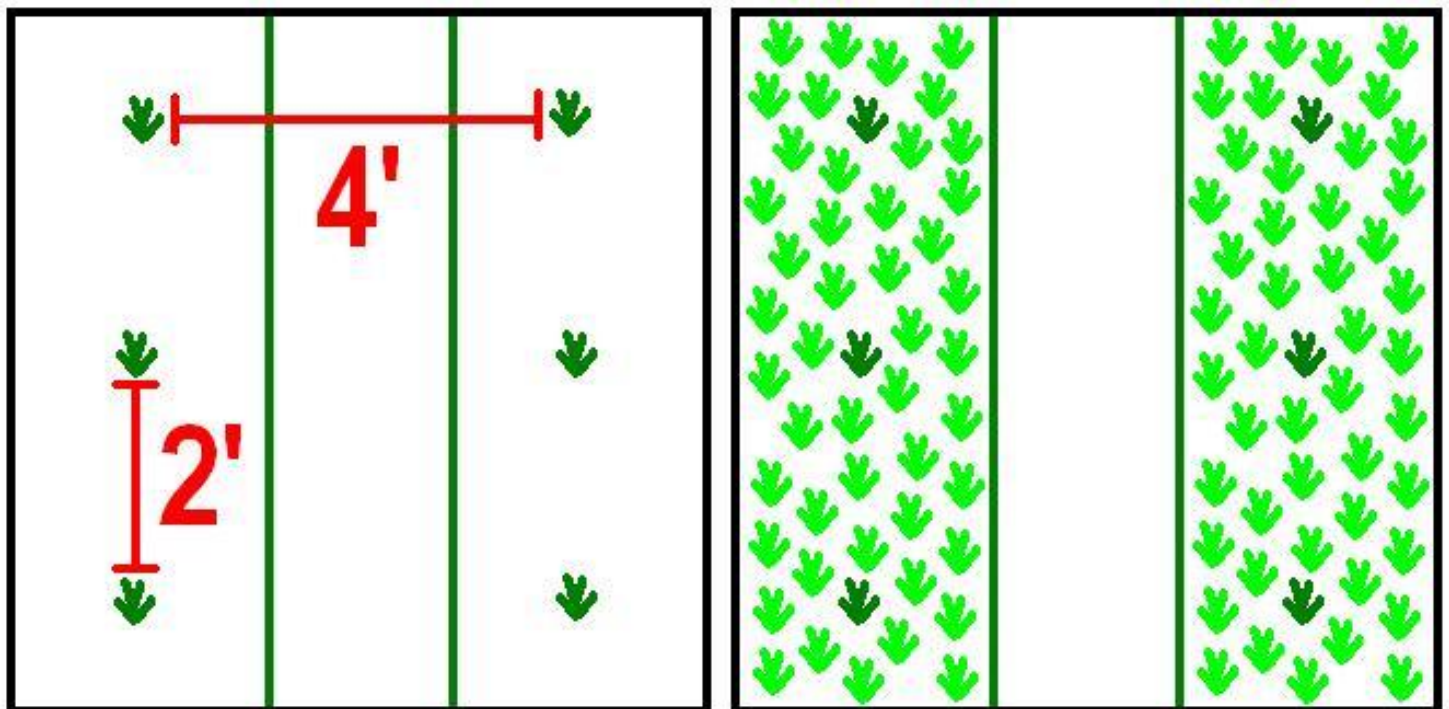
As discussed above, the three types of strawberries are June-bearing strawberries, ever-bearing strawberries, and day-neutral strawberries.

June bearing strawberry plants are most often planted using the matted row system, while day neutral strawberry plants and ever-bearing strawberry plants are often planted in a hill system (also called the mound or mounding system). These two systems usually yield the best crops. However, spaced row systems, single hedgerow systems, and double hedgerow systems are also used. For gardeners who don't have access to enough land to plant a strawberry patch, strawberry planters can also be used.

The Matted Row System:

The matted row system for growing strawberries is most commonly used for June bearing varieties, and it works well for any cultivar that sends out a lot of runners. To grow strawberries with this system, set plants about 24 inches apart (18 to 30 inches is acceptable) in rows about 4 feet apart. Allow runners to spread freely and root at will within the row to form a crisscrossed, matted row about 24 inches wide.

The matted row system of growing strawberries will produce the largest number of strawberries, but the quality of individual berries is rarely equal to the quality of berries grown with the hill system. Here is a diagram of how to use the matted row system to grow strawberries:



Matted Row System

Introduction to the Matted Row System

The matted row system of growing strawberries is decades old. It was developed after the modern Garden Strawberry became the dominant strawberry grown. Growing strawberries in the matted row system has multiple benefits. Chief among them is increased yields over all but the modern commercial plasticulture methods (which require specialized farming equipment).

By using the matted row, gardeners and some commercial growers can take advantage of the unique characteristics of strawberry plants in order to get the most out of their land, out of their effort, and for their taste buds.



How Growing Matted Row System Strawberry Plants Works

The matted row system is an old method of growing strawberries that has been used with great success by a host of commercial and pick-your-own strawberry farms. It is also commonly used in regions that have a colder climate. In this strawberry production method, strawberry plants are set out on cultivated and fertile bare land at regularly spaced intervals within regularly spaced rows. This initial planting is allowed to grow, send forth intertwining strawberry runners, and establish those daughter plants within the row. This interlaced and crisscrossed network of runners creates a matted tangle of strawberry plants, hence the name “matted row.”

The matted row system takes a full year (12 months) before a crop is harvested. This is why the newer plasticulture methods have become popular as they make possible a harvest in as little as 7 to 8 months after planting. The cost of purchasing strawberry plants, however, is usually much lower than with newer methods. The matted row system allows the strawberry plants to multiply themselves into the rows to maximize production. Each planted strawberry plant will multiply its production by sending out and establishing daughter plants that will produce their own strawberries for harvest the following spring. Further reducing planting costs is that fact that the matted row strawberry system makes the most of the perennial nature of strawberry plants. Each matted row is allowed to produce until the plants lose their productive ability, which is usually between 2 and 4 years.

One of the drawbacks of the matted row system is that the strawberries require tending all year long. The strawberry renovation process must be done each year after harvest, and, of course, the strawberries have to be harvested by hand. However, if you are growing your own strawberries, this last chore can be quite pleasurable as those fresh strawberries are sampled to make the work easier!

Matted Row System Strawberry Varieties

There are a few different types of strawberry plants that are commercially available. Day-neutral and Everbearing strawberry plants are best grown in systems other than the matted row system. The matted row is most appropriate for growing June-bearing strawberry. Virtually any June-bearing strawberry cultivar will do well in matted rows. Some of the more popular varieties for planting in matted rows are: Allstar, Delmarvel, Earliglow, Honeoye, and Jewel. Be sure to call your extension agent or reference the list for your state above if you are uncertain which variety to choose.

Details of Growing Matted Row Strawberries

It takes 12 full months after planting strawberries in the matted row system to see a full crop ready to be harvested. But, since the rows will usually produce for multiple years, the initial time sacrifice can be recuperated in subsequent years. Typically, one can expect between 6,000 and 8,000 pounds of strawberries to be produced per acre of land planted with strawberry plants using the matted row system. To determine the appropriate number of strawberry plants to purchase per acre of land to be planted based on spacing, see the **DETERMINE THE CORRECT QUANTITY OF PLANTS YOU NEED** section above.

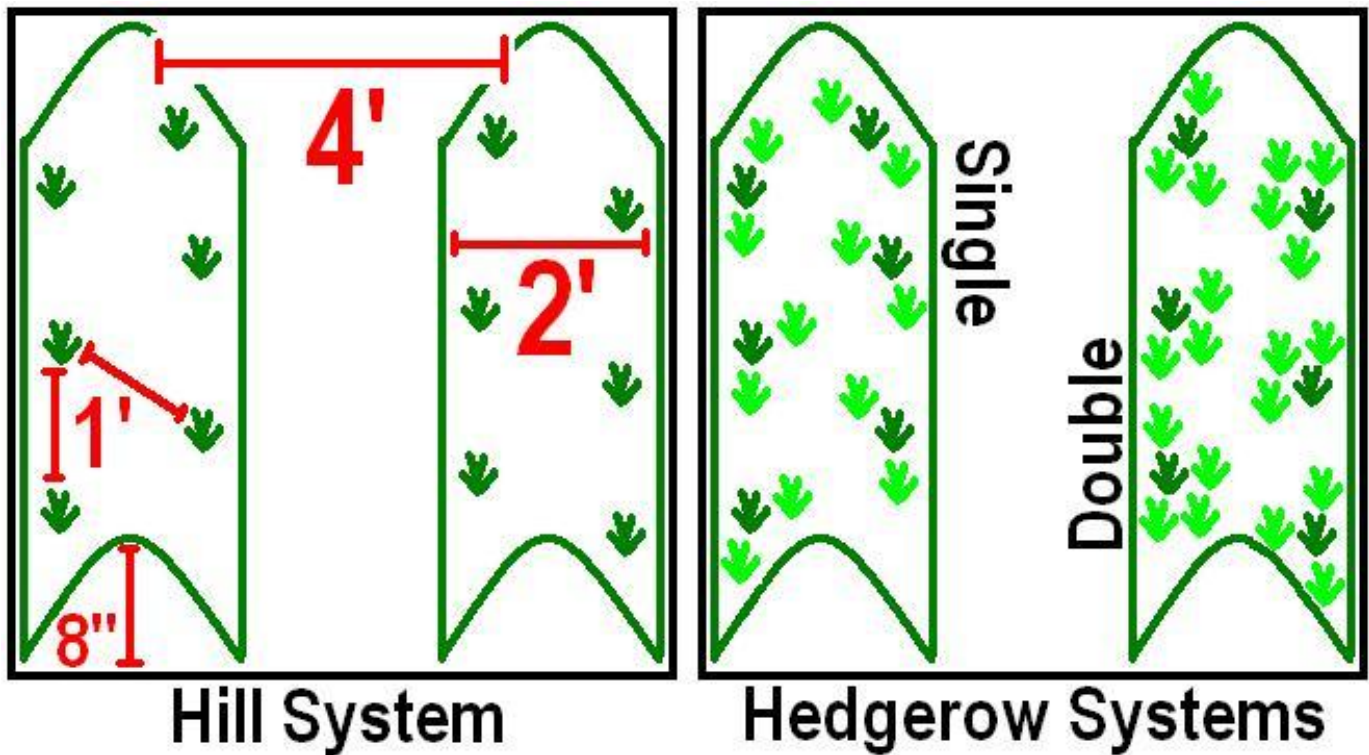
Using matted rows is likely the best option for home growers and hobby gardeners. It minimizes annual costs and maximizes garden space. The matted row can also be adapted for square foot gardens by allowing the matted row to become a matted square, usually planting one strawberry plant per square foot in the initial planting and allowing the runners to populate and fill the rest of the 4×4 square.

The Hill System (also known as the Mound System):

The hill system for growing strawberries is most commonly used for day neutral strawberries and everbearing strawberries (although both can do well in the matted row system as well). To grow strawberries with the hill system, you start with a mounded “hill” of soil about 8 inches high and 24 inches across. Extend this mound into a row as long as you like. Set two rows of plants per hill in a staggered pattern with each plant being 12 inches from the other plants. Multiple rows are spaced 4 feet apart.

All runners are removed from every strawberry plant in the hill system as soon as they are identified. Removing the runners causes all the productive capacity of the mother plants to remain with the mother plants. This energy will result in additional lateral crowns adjacent to the original crown and more flower stalks for fruiting. The hill system is often used by the home gardener because it results in a higher quantity of higher quality berries (fancier, larger, better for selling at farmers’ markets), while the matted row system usually produces a higher total number of strawberries.

There are two modified versions of the hill system: the single hedgerow and the double hedgerow (also called the spaced-row system). These systems are the same as the hill system except that some runners are permitted. In the single hedgerow system, each strawberry plant is allowed to root two additional runner plants. The double hedgerow permits several runners to root. All runner plants in this system should be spaced at least 4 inches away from other plants (5 to 7 inches is better).



Using Strawberry Planters:

Strawberries will grow in planters almost as easily as they will in the contiguous ground. Whether the planters are hanging or pots on the ground, as long as there is adequate soil, sun, space, and water, they will do fine and produce just like plants in the ground.

Two main things to note when using pots or planters: space and soil moisture are more of a concern. Runners often do not have enough space to root when using strawberry planters, and they should be trimmed off immediately or trained so that they can root in their own pots. With more of the container exposed to heat and wind, moisture also tends to evaporate more rapidly from soil in pots than soil in the ground. Give extra care to your hanging or potted strawberry plants, and they will do just as well as plants in the ground for you, with one exception: the topsy turvy strawberry planter...

The Topsy Turvy Strawberry Planter

With the number of chemicals, pesticides, and other unnatural residues found on and in our food these days, many people are turning to growing their own edibles. Since there are often significant quality improvements gained from home-growing food, this is often a great thing for both sustainability and the health of the growers. With the trend being toward more gardening, even those with less space are beginning to venture into the realm of produce production.

One of the challenges of growing food for the freshly-minted green thumb is deciding on space. Most rural or semi-rural folks simply dig a hole, put seeds or strawberry plants into the hole, and let the plants do their thing. Even city slickers often will have a usable section of their yard or space to build a raised-bed garden. Urban dwellers can often find an area for a community garden. But, particularly for those living in urban areas, space-



utilizing tools are often employed to grow food in areas of contained soil. Usually, pots on a window sill or porch are used, or a hanging basket is utilized.

However, there is a new kid in town: the Topsy Turvy strawberry planter. These “upside down” strawberry planters are modeled on the successful version used to grow tomatoes in small spaces. However, strawberries and tomatoes have very different functional anatomies, and strawberries don’t do well with hanging upside down. Since these specific planters are popular (although the popularity of the strawberry version is waning for reasons that will shortly be discussed), they deserve special mention at this point. There are both pros and cons of growing topsy turvy strawberries, but the cons outweigh the pros.

Topsy Turvy Strawberry: Benefits

Topsy turvy strawberry planters can provide several benefits to the gardener or green thumb looking to use them to grow their plants. First, the planters themselves are not too big and can be hung virtually anywhere. This can allow placement where it is harder for ground-borne pests to get at them. Slugs and other creepy-crawlies will have a difficult time traversing upward to get at your harvest. However, they may become more visible to hungry birds. They are also relatively small, making them easy to place virtually anywhere there is a few cubic feet of available space.

They are also attention-grabbing. Due to the fact that they aren’t ubiquitous, their status as a novelty is likely to get both questions and attention from your neighbors or visitors.

Also, it is fairly easy to water strawberries in these planters. Water in the top, and gravity pulls it down where it needs to go! On the whole, however, it is the opinion of this author that the drawbacks outweigh the benefits of planting strawberries upside down using the topsy turvies. Here is why:

Problems with Topsy Turvy Strawberry Planters

While it is undeniable that using strawberry planters is a good decision for some people with significantly restricted options available to them, most people will find the most success growing their strawberry plants in the ground to avoid the problems that can arise when using the hanging strawberry planters.

First, growing strawberries upside down is simply unnatural. In this arrangement, plants start growing downward, then try to grow upward toward the sun to maximize photosynthesis, and then are often pulled back downward by their fruit loads. This down-up-down process puts unnecessary and unnatural stress on the plants.

Second, root systems of virtually all plants grow downward into soil or other nutrient mediums. In the topsy turvy planters, this natural process is somewhat thwarted. The plants are expected to grow downward while the roots are planted in the soil above. If the roots continue to operate according to nature, they will try to grow out of the soil and toward the plant in the search for additional nutrients. While the topsy turvy strawberry planters are better than the completely upside-down planters, there is still little support for the vegetative parts of the plants which, when ready for harvest, can pull on the root systems and cause undue strain just as if it were an inverted strawberry planter.

Third, inverting strawberry plants not only stresses their structural architecture, it also increases the likelihood that they become diseased. Strawberry plants are often susceptible to fungi and other pathogens. With the topsy turvy planters, watering the plants often results in the hanging plants getting soaked repeatedly with dirty water as the soil is watered enough to keep it moist. The increased moisture can create a favorable environment for fungi.

Fourth, while the plants in planters may be easy to water, they tend to dry out. Strawberries are notoriously finicky about their water requirements (too much and they'll rot, too little and they'll die). Because of this, additional care is required to see that evaporation loss does not lead to plant death. Consequently, more water may be used during hot weather. And, excess watering can diminish the quality of the soil by flushing away needed nutrients.

Fifth, hanging strawberries are also more susceptible to freezing in the winter months. Without special care, your strawberry plants will likely suffer cold injury without additional precautions. With cold weather, the topsy turvy strawberry planters will often allow the cold to kill the plants, thus causing you to lose the benefit of strawberries being perennial in nature.

Strawberry Topsy Turvy: Conclusion

If you are going to grow strawberries upside down, know what you are getting into. While it may be a novelty to go all strawberry topsy turvy, the plants will likely do much better (and be happier) in a traditional, right side up position. You are asking for trouble (dead plants) if you use the typical upside down planters with the hole in the very bottom, and it is not recommended at all for strawberries.

Using the topsy turvy strawberry planter is a better option than the typical topsy turvy garden plant planter as it minimizes the problems above, but ground growing is still the best method for growing strawberries.



GARDEN OR STRAWBERRY BED PREPARATION

Once the plants are in the ground, it is important to create an environment that is most conducive to growing strawberries. Mulching is a time-honored method for making the growing strawberries happy.

After you've planted your strawberry plants, mulch the strawberry bed with pine needles, compost, or straw. Pine needles are a good choice as they slightly raise the acidity of soil as they decompose. Mulching also keeps the soil temperature down, mitigates the weed problem, and keeps the fruit cleaner by keeping the strawberries off of the dirt. Most varieties of strawberries produce better when their roots are in cooler soil.

Preparing Your Garden for Planting Strawberries

Once you have decided where you will be growing strawberries, you need to prepare your garden for planting strawberries. If your site is sod-covered, it is best to cultivate and till the area the year before you want to plant your strawberries to eliminate competing grasses. When possible, it is best to grow a green manure crop the year before you want to begin growing strawberries to improve soil quality, especially for large plantings (oats, sudan grass, and rye are all excellent for this).

When you are ready to plant your berry plants, you should, to the best of your ability, ensure that the site is free of weeds, grubs, and any soil-borne diseases. Once any sod or grass is gone, work two to three inches of compost into the top layer of soil. Add more organic material before planting, especially if the soil doesn't retain moisture very well. Peat, compost, or aged straw and manure are good options. Additionally, organic or inorganic fertilizer can further improve soil quality by being worked in down to six inches.

The pH of your site's soil is also important for growing strawberries. In order to grow strawberries most effectively, the soil needs to be slightly acidic. Strawberry plants will grow in dirt that has a pH between 5.0 and 7.0, but 5.8 to 6.2 is ideal for maximum growth and production. Soil test kits are available online and through garden supply stores. However, the best results are obtained through the professional soil testing services provided by your county's agricultural extension agent. Before planting strawberries, you should test your soil and amend it as indicated to create the best possible environment for growing strawberries.

Common amendments are lime and manure. If test results show that lime is needed, it should be applied prior to planting the strawberry plants and tilled in thoroughly with the soil. Compost or aged manure from cows or horses is also added, usually at a rate of 2 to 5 bushels per 100 square feet.

WHAT TO PLANT WITH STRAWBERRIES (COMPANION PLANTING)

Many books have been written on companion planting; and strawberry plants, like most other plants, can benefit from being planted in close proximity to other flora. This section of The Strawberry Growing Master Manual will discuss what to plant and what not to plant with strawberries. The most beneficial plant to plant in close proximity to strawberry plants is likely the culinary herb borage. But before delving into the relationship between strawberry plants and other garden plants, a brief bit of background information may be helpful.

Do Strawberry Plants Need Companion Plants?

At its heart, all companion planting is based on the theory (backed by significant evidence) that planting different plant species in close proximity can, in the right combinations, produce mutually beneficial and even synergistic results. Many combinations have been discovered and shown to positively influence nutrient uptake, aid in controlling harmful pests, and increase pollination (among others). Each synergistic improvement tends to yield benefits in the health and productivity of the crop.

The increased biodiversity is usually beneficial, but the planting of various plants in close proximity often yields multifaceted benefits. Two of the primary benefits are pest control and increased yield. There are many resources available to help develop a garden (or even a permaculture) that thrives based on mutual assistance and inter-connectivity of well-planned companion planting layouts. The purpose of this manual, however, is to deal specifically with companion plants for strawberry plants and what benefits can be achieved by companion planting strawberries in your garden.

So, do strawberry plants need companions? The answer depends upon who is asking. If you are a commercial operation, strawberry plants don't need companion planting. The commercial strawberry plants (and consequently the strawberries) are usually doused with pesticides and petroleum-derived fertilizers. Plus, planting anything other than strawberries on a commercial strawberry farm may decrease the overall yield derived from modern farming practices.

But, if you are a home gardener, planting strawberry plants alongside borage or other helpful plants can make a lot of sense. Organic and sustainable agricultural practices are pushing their way into the mainstream, and this is a good thing. So, if strawberry plants are in your garden (or will be), and you don't want to be completely dependent on pesticides or non-organic fertilizers, companion planting is a good idea.

Companion Planting Strawberries and Borage

The herb borage (*Borago officinalis*) is known primarily as a culinary herb, but it has other benefits as a companion plant when planted with strawberry plants. Borage is widely accepted as one of the best companion plants for its observed effects within a garden. And, it has a specific affinity when planted alongside strawberry plants.

Strawberry plants and strawberries have numerous pests and pathogens that can kill or maim them. Planting borage next to strawberry plants serves several beneficial functions for the strawberry plants. Namely, the borage plants tend to deter many of the insect pests that can afflict strawberry plants. Additionally, they are a powerful pollinator attractor and can make pollination more robust.

With the attraction of pollinators, the borage plants also bring other helpful defenders of strawberry plants: predatory insects. Praying mantis and predatory wasps are frequently drawn to gardens where borage is planted (along with others). Predatory insects cannibalize other insects that would do damage to strawberry plants, given the chance.

Perhaps the biggest benefit of planting strawberries with borage, however, is that the flavor profile of the strawberries themselves is improved. Of course, taste is a subjective thing, but most gardeners who have started planting strawberry plants with borage note flavor improvement. And, while borage won't work in the same way as heavy doses of fertilizer and pesticides, it does positively impact strawberry yield. It is also believed that borage plants increase the level of trace minerals in the soil in which they are planted making the strawberries planted near them even more beneficial for health!

Spacing Borage and Strawberry Plants

Borage plants do not need to be alternated with strawberry plants in order to provide mutually beneficial results. In fact, lots of them aren't required. If June-bearing strawberries are planted in the matted row system, one borage plant every 3 to 4 feet in the center of the matted row should be sufficient. Of course, feel free to experiment and determine the best spacing and location for your given climate, soil, and strawberry variety.

Strawberry Plants and Borage: Extra Benefits

If borage plants are planted, they will attract many pollinators. These pollinators will help fertilize many of the plants in a garden. Plus, bees absolutely love borage and make a delicious honey from its nectar. If you happen to be a beekeeper as well as a gardener, keep this in mind!

Borage is also edible itself. Its leaves have a mild cucumber taste and the flowers are also edible and lightly sweet as well. The leaves can be used in salads or drinks and as a garnish for summer desserts. They can also be prepared and eaten in the same fashion as spinach.

When it comes to planting borage with your strawberry plants, adopt Nike's old slogan: Just Do It! It will benefit your strawberries, benefit your other garden plants, and benefit your health as well. Plus, the borage plant itself is a fantastic example of unique beauty

More on Companion Planting Other Plants with Strawberries

Interestingly, the scientific causes of many of these relationships are not fully understood. But, the principles work and the beneficial symbiotic relationships can be measured among many types of plants.

Companion Planting Strawberries

To begin, it is important to remember the nature of strawberry plants. They are prolific, can be somewhat invasive, and most varieties will quickly form a thick matted row made up of strawberry runners if left alone. Because of this, it is best to think in terms of which plants can help strawberries grow, not the other way around. While strawberry plants themselves hurt relatively few other plants (the exception will be discussed below) by being planted near them, their rapidly expanding range can end up depleting nutrients or competing with other plants if they aren't actively monitored.



Strawberry Companion Plants

There are several other plants beneficial to strawberry plants. They are:

Borage (*Borago officinalis*)

This herb is a virtual magic bullet when it comes to companion planting.

Bush Beans (*Phaseolus*)

The common bean is known benefactor of strawberry plants. It repels some beetles and hosts nitrogen-fixing bacteria which serve to fertilize the soil for better strawberry yields.

Caraway (*Carum carvi*)

Caraway is another herb that indirectly benefits strawberry plants by being nearby. The primary benefit of caraway is that it attracts parasitic wasps and parasitic flies that are voracious predators of many common strawberry pests.

Lupin (*Lupinus*)

This flower is actually a legume. Like the beans mentioned above, it also fixes nitrogen in the soil, thereby fertilizing for surrounding plants, including strawberries. It also attracts honeybees.

Strawberry Companion Planting: Danger!

Not all plants will even tolerate the presence of strawberries, however. The most notable garden plants that are harmed by the proximity of strawberry plants are those related to the cabbage.

Cabbage Family (*Brassica oleracea*)

Avoid planting strawberries near members of *Brassica oleracea*. The cabbage family plants will have their growth impaired by strawberry plants close by. The major members of the cabbage family include: broccoli, broccoflower, Brussels sprouts, cabbage, Chinese broccoli, cauliflower, collard greens, kale, kohlrabi, and Romanesco broccoli.

Verticillium-Susceptible Species

The most common of these plants are tomatoes, potatoes, eggplant, and peppers. If these plants (or melons, okra, mint, bush or bramble fruits, stone fruits, chrysanthemums, and roses) have been grown in the same spot recently (within 5 years), it is best to grow your strawberry plants elsewhere. Otherwise, the strawberry plants may be infected and die themselves.

Companion Planting Strawberries: Conclusion

The strawberry companion plants listed here are the well-established ones that have consistently demonstrated the mentioned benefits or drawbacks. However, there are surely more plant species out there that will interact either positively or negatively with strawberry plants. Feel free to experiment!

EARLY-SEASON STRAWBERRY CARE

If you have decided to grow strawberry plants, you probably don't want to wait to reap the fruits of your labor. I don't blame you. However, delaying gratification now can result in higher quantities of strawberries later. Additionally, it is important to treat June-bearing strawberries differently than everbearing strawberries and day-neutral strawberries.

All types of strawberry plants will produce better in subsequent years if all their energies are devoted to establishing themselves and producing healthy runner plants in the first year. To accomplish this requires a feat of delayed gratification. To have the strongest plants in subsequent years, you have to remove all the flower buds in year one. Without flower buds, you won't be able to enjoy harvesting strawberries. But, you'll get more and better berries beginning in year two. Few people do this, but most should.

For June bearing varieties, you can train the runners to follow a specific pattern, or you can allow them relative freedom in a matted row system. In general, all strawberry plants will produce best when limited to a density of approximately five plants per square foot. Too many strawberry plants will have the same effect as weeds would: reduced yields of smaller strawberries. Of course, any and all weeds should be removed.

For day neutral and everbearing strawberry plants, the removal of buds *and runners* should occur until July 1st of year one. They naturally don't put out as many runners as June-bearers. Instead, they focus their energy on producing multiple strawberry harvests. You may end up getting a small harvest with everbearing or day-neutral varieties, depending on your climate.

The main harvest will come in the second year when all mother plants and all the runners which were well-rooted before the end of September or October will produce strawberries!

WATERING STRAWBERRIES

Water Requirements for Growing Strawberries

Growing strawberry plants require a constantly moist environment, so regular weekly watering is needed. To have the most success growing strawberries, at least an inch of water should be provided to the plants either through rainfall or direct supplemental. Up to two inches of water can be given while the fruit is forming, from early bloom until the end of harvest. Watering should continue during dry periods in August and September. This later water helps reduce stress on the strawberry plants which helps fruit bud formation in the following year.

Remember, while water is critically important when growing strawberries, they do not like to sit in standing water. This is why your site needs good drainage. Strawberry plants are relatively shallow-rooted, so soggy ground can cause them to rot while dry ground can kill them or stop fruit production. Mulching helps keep the moisture level of your soil more consistent.

FERTILIZING STRAWBERRIES

Fertilizing helps growing strawberry plants reach their maximum potential. It can be beneficial to fertilize multiple different times during the life of a strawberry bed.

First, a balanced (10-10-10) fertilizer should be added just before planting your strawberry plants. Add one to two pounds of fertilizer per 100 square feet. This helps increase the nitrogen levels in the soil.

Second, during the first year of the strawberry garden, another round can be applied after the strawberries have been planted for around four to six weeks, and again in August, depending on plant growth.

Third, day-neutral and everbearing strawberries can be fertilized after the first harvest. June-bearing strawberries should be fertilized during renovation. This is done to keep the plants vigorous. Be sure to water the fertilizer well to get it to soak in down to the roots of the growing strawberries.

You should *not* fertilize your strawberry plants in the spring of a fruiting year. Too much nitrogen will result in soft, easily-damaged strawberries. You can still fertilize after the initial crop for day-neutral and everbearing strawberries, and you should also fertilize immediately after renovation once the plants are completely dry. Applying fertilizer to wet strawberry plants can result in phytotoxicity, and no fertilizer particles should remain lodged on the plants or in the plants' crowns. After application, sweep your plants with a broom or other suitable tool to dislodge any stuck fertilizer.

You do have to be careful when fertilizing growing strawberries. If you apply too much fertilizer, you will get excessive leaf growth and poor production of flower stalks. If you plant strawberries in colder climates, late-season fertilizing can cause new growth that will be damaged by cold-weather frosts. Indeed, I have grown strawberries without any fertilizers in less-than-optimum soil and still gotten a reasonable harvest, so it is better to fertilize too little than too much until you become experienced.

If you prefer growing organic strawberries, blood meal can be used to increase nitrogen while bone meal can be used to increase phosphates. Growing organic strawberries with these organic fertilizers requires application about once per month from June through September.

PROPAGATING STRAWBERRY PLANTS

There are three main ways to propagate strawberry plants. The plants can be divided and transplanted once multiple crowns have been grown (or division of rhizomes), new plants can be grown from strawberry seeds, or the runners that strawberry plants put out can be controlled, guided, and caused to root where clone plants can be utilized most efficiently.



There are positives and negatives about propagating strawberries with each method, all of which will be discussed shortly. However, to offer the bottom line up front, most gardeners will find that the easiest way is to propagate strawberry plants by runner.

Strawberry Propagation by Plant Division

Many types of strawberry plants will, either by nature or if encouraged by pruning runners, put out lateral crowns at the base of the strawberry plant. These lateral crowns can be divided and replanted to propagate strawberry plants. Additionally, the genetically generative rhizomes of strawberry plants can, under the right circumstances, be divided into multiple pieces with each piece being sufficient to grow a new plant.

There are, however, several drawbacks to this type of strawberry propagation. Often, the mother plant will be compromised (if not done correctly) and will die. Thus, the net increase of strawberry plants is diminished. Also, it tends to be more labor-intensive and technical as the division or cutting takes both precision and a bit of expertise. However, for well-funded or commercial operations, this division can be used to propagate cloned plants quickly and extensively.

Strawberry Propagation by Planting Strawberry Seeds

Growing strawberries from seeds has the potential for vast numbers of new strawberry plants to be grown. Each strawberry has approximately 200 seeds adorning its outer surface. While unusual for every seed to be viable, that is still a lot of new plants from a single strawberry. Starting strawberry seeds will require most of the standard seed-starting equipment to be used. And, while starting strawberry seeds often requires a few more considerations than does starting common garden vegetables from seeds, it is not overly difficult.

The major drawback of strawberry propagation by seed is the nature of today's common strawberry cultivars. Once the Garden Strawberry (*Fragaria x ananassa*) became the dominant strawberry grown in both home gardens and commercial operations, the seeds became unreliable due to the crossbreeding used to obtain the improved strawberry varieties. This means that attempting to grow strawberry plants from seeds that were collected from a purchased strawberry will likely not produce true plants. In other words, the plants grown from seed will be different from the plant that produced the seeds (sometimes substantially so). The seed-propagated strawberry plants will exhibit genetic traits of the grandparent plants instead of the desired parent plant. The wild strawberry species are an exception to this and will produce plants true-to-form. However, their fruits are much smaller, in general, and not recognized by most as the "strawberries" that are commonly bought and consumed today.

Strawberry Propagation by Runners

Growing strawberry plants from a runner is, for most, the easiest and quickest way to propagate strawberries. Most of the June-bearing, everbearing, and day-neutral varieties produce runners. Some of the wild strawberry varieties do not and must be propagated by seed. But, in general, if someone buys a strawberry plant, it will produce at least a few runners.

The strawberry runners are stolons. These horizontal stems are sent outward from the base of the strawberry plants. At variable distances new strawberry plants will form (at nodes). This is possible because of a strawberry plant's ability to form adventitious roots. These specialized roots are formed at the nodes along a runner. Wherever these roots touch nutritious soil, they will continue to grow into that soil and establish a new clone plant that genetically identical to the plant that originally sent forth the runner.

Due to this aspect of runners, it is relatively easy to propagate strawberry plants using them. The long, flexible internodal parts of the runners allows them to be bent and positioned according to the desires of the gardener. To collect new clone strawberry plants, all one has to do is direct the runners so that the adventitious roots will grow down into a separate, moveable container.

Any small container or pot properly filled with a sandy loam soil will work. It can be buried so that the strawberry plant runner will stay at ground level, or the pot/container can be placed on top of the ground so that it is more easily removed once the new strawberry plant is well-rooted and established. Either way, the runner can be held in place by clothespins, rocks, a pile of dirt, a couple of sticks, or anything else suitable for keeping the runner in position and the node portion in contact with the soil.

Once the adventitious root has established the new clone plant, separate the new plant from the mother strawberry plant by snipping the runner. If it has been established for a while, the runners will eventually shrivel and snap on their own. But, as long as the new plant is well-rooted, no growth will be hindered by snipping or snapping the runners.

Voila! You now have a new, transportable strawberry plant that you can sell, use to start a new strawberry bed, or use in some other imaginative way!

For a new gardener, strawberry propagation by runner is usually the easiest and most successful means of acquiring new plants from existing ones. But, don't hesitate to try the others if up to the challenge. Also, not all strawberry plants produce the same amount of runners. You will likely have the most runners with June-bearing varieties.

SAVING STRAWBERRY SEEDS

If you want to grow strawberry plants from seed, you may want to consider saving heirloom strawberry seeds from year to year (heirloom strawberry seeds are the same as non-hybrid strawberry seeds). Fortunately, it is relatively easy to learn how to save strawberry seeds so that you can begin growing strawberries from seeds that you saved. Here is the easy way to save your seeds:

Put your ripe strawberries into a household blender. Add one cup of water to the strawberries in the blender and blend on high for 3 to 5 seconds. Try not to exceed 5 seconds of blending time, or the strawberry seeds may be damaged. Allow the components to sit for a minute or two. The viable seeds will sink and the unviable seeds will float along with the strawberry pulp. After the good strawberry seeds settle to the bottom, pour off the bad seeds and fruit pulp with the water. Rinse the seeds and then transfer them to a paper towel (or low-heat dehydrator) to dry. When dry, store the strawberry seeds in a cool, dry place.

If you prefer to use a non-blender method, you can try an alternative strawberry seed saving method. If you dehydrate a strawberry (or let it dry completely), you can use your thumb and forefinger to rub the strawberry so that the seeds fall off. Separate the seeds from the chaff and store in a cool, dry place.

Or, if you prefer still another method, you can also use a sieve. Take a strawberry, press the pulpy part through the sieve, and the seeds should be left in the sieve. Rinse the seeds, dry, and store the strawberry seeds for future planting.

TRANSPLANTING STRAWBERRY PLANTS

Most strawberry plants will produce many runners over the course of its life. For the home gardener, this is great! You get to buy (or otherwise obtain) a few strawberry plants and watch them multiply themselves exponentially. However, the little fellas don't know when to stop producing runners when the maximum productive capacity of a confined strawberry bed is reached.

So, a gardener who desires lots of high quality strawberries will have to remedy this overcrowding. It can be done either by monitoring each plant and snipping off excess runners, thinning the plants, or transplanting the plants to a new area. Also, if the soil isn't particularly well-suited for growing strawberries, transplanting strawberry plants to a rich, sandy loam with good drainage can make all the difference in the world.

Transplanting the unneeded strawberry plants to new beds can also help develop new strawberry patches and initiate a strawberry bed rotation system that maximizes strawberry production. Additionally, thinning an existing bed by removing and transplanting extra plants elsewhere increases air flow which can help reduce many of the fungal diseases that commonly afflict strawberry plants.

Transplanting Strawberry Runners

In general, the established plants are going to produce the most and biggest strawberries. It takes some time for a strawberry plant to root well and produce maximally, so a gardener should count on year 2 and year 3 being the years where a strawberry plant is most productive. Some strawberry plants will still produce exceptionally well in year 4, but most will start to lose a bit of their youthful vitality after year 3.

To leave the roots of the most established strawberry plants intact (so that they will continue to produce strawberries at their highest possible level), it is usually best to transplant strawberry runners that were sent off and rooted the same year you will be transplanting. Whether you let the strawberry runners establish at will or guide them so that they establish into moveable pots or containers, the next section will deal with what to do next.

When to Transplant Strawberry Plants

So, when should you transplant strawberry plants? If you purchase strawberry plants on the internet, you will likely be mailed the plants in the spring according to the recommended planting time for your hardiness zone. If you get them in the spring, put them in the ground as soon as possible.

As it takes a while for the plants to establish themselves, foregoing the smaller crop during the subsequent growing season after planting will provide much larger harvests in following years as has been discussed previously.

If you already have an established bed, you should generally transplant strawberry runners that have already established themselves. Carefully digging up the younger plants should be done in the fall. Typically, late August or early September is the best time to transplant for most of the zones in the United States. However, in the warmer zones of the south, transplanting can be done later. In the much cooler climates, transplanting strawberry runner plants can be done earlier.

By transplanting strawberry runner plants at this time (in late August), the yields obtained during the following growing season will be maximized. Remember, however, that strawberry plant transplants can grow

successfully at just about any time during the growing season as long as they are well-watered and have a hospitable growing location, but transplanting them during the hot summer months takes its toll on the plant.

How to Transplant Strawberry Plants

It is important to know how to transplant strawberry plants correctly so that they aren't unnecessarily damaged and the stress to the transplant plants is minimized.

To transplant:

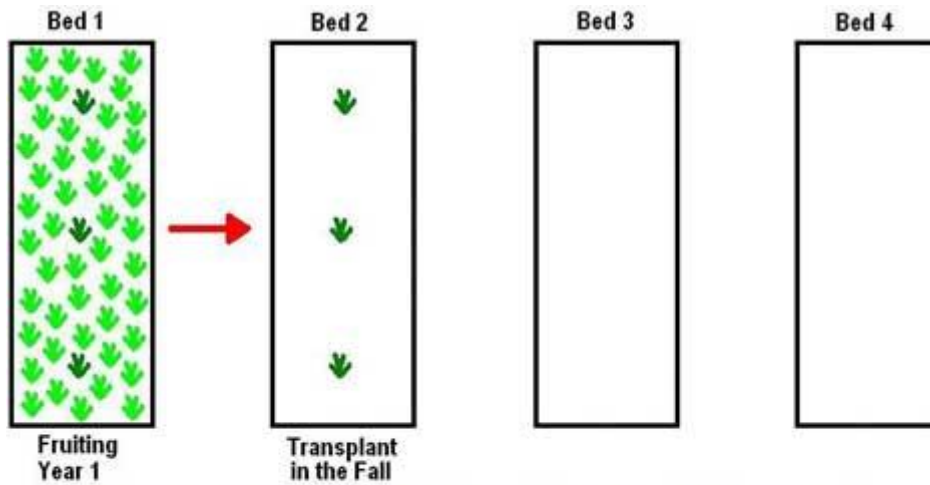
1. Prepare your new location first. Make sure it is hospitable, sunny, rich, sandy loam, well-drained with slightly acidic soil, generally well-suited for strawberry plants, and historically acceptable (no *Verticillium*-susceptible plant species planted there recently).
2. Select the strawberry plants you will be transplanting. Generally, it is best to transplant established, young runner plants that are only a few months old. Choose only strawberry plants that look healthy, and remove any flower buds, damaged or discolored leaves, and runners prior to transplanting.
3. Obtain a substance or material that will hold moisture. Sphagnum or peat moss is probably best, but something as simple as wet paper towels is usually sufficient. It is very important to keep the roots of your transplant strawberries moist during the transplanting process.
4. Dig up your selected and prepared runner plants (or other strawberry plants). Take care to remove as much of the strawberry plant's roots as possible from the ground (so that most of the roots are attached to the plant). Once free of the ground, cover or wrap the roots with your moistened peat moss (or other selected moistener).
5. Transplant strawberries to your new, prepared strawberry bed. Do not dig up all the selected strawberry plants at one time and then try to plant them all at one time. Transplant one strawberry plant at a time. After each plant is in the ground at its new location, water it thoroughly before transplanting the next selected strawberry plant. This minimizes stress and increases the probability of success. Waiting until all the plants are transplanted before watering all the transplants simultaneously with a sprinkler or other apparatus may cause unnecessary plant loss.

Transplanting Strawberries: Systems

To maintain the vigor and production of your strawberry plants, you may want to utilize a strawberry transplanting system. By transplanting strawberry plants to new strawberry beds each year, you can maintain three (or more) vigorous, well-producing beds. The steps below can be modified to allow the strawberry plants to fruit for additional years or fewer years as desired. By not transplanting each year, you can maintain the cycle with fewer strawberry beds.

Year 1: Transplant Strawberry Plants from Established Bed

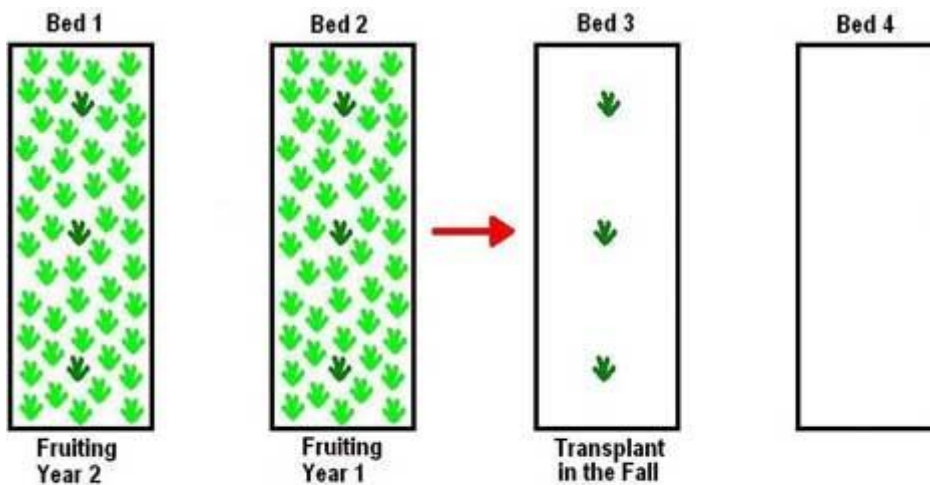
If you ordered strawberry plants online or bought them from a local nursery and planted them in the spring, the strawberry bed likely won't be established and into "Fruiting Year 1" until the following spring. At the end of the first fruiting year (the first year of the strawberry transplanting cycle), transplant several of the healthy, well-established strawberry runner plants to a new bed (bed 2) in the fall. Take care of your beds and winterize them appropriately.



Transplant System, Year 1

Year 2: Two Fruiting Strawberry Beds, Another Fall Transplant

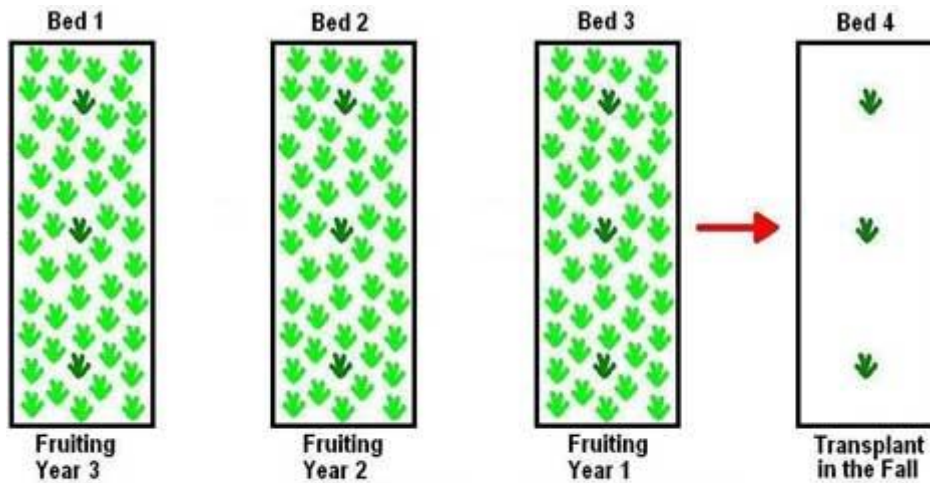
In year two of the system, the transplant strawberries in bed 2 will produce runners during their first fruiting year. The strawberry plants in bed 1 should produce a good crop as the strawberry plants will be in their second fruiting year. You may need to thin the runner strawberry plants in bed 1 if they become too thick. In the fall, transplant strawberry runner plants from bed 2 to a new bed (bed 3). Overwinter all beds again.



Transplant System, Year 2

Year 3: Three Producing Beds, Another Transplanting Strawberries Session

Bed 1 is now in its third production year. It is likely that these old plants will begin losing their productive capability soon. Beds 2 and 3 should also provide ample harvests. In the fall, transplanting strawberries occurs again. Following the same pattern, runner plants from bed 3 are transplanted into bed 4 in the fall. Also in the fall of year 3 after the strawberry plants in bed 1 have completely finished producing strawberries, they should all be removed. After removing, the renewal process should begin and continue into year 4.



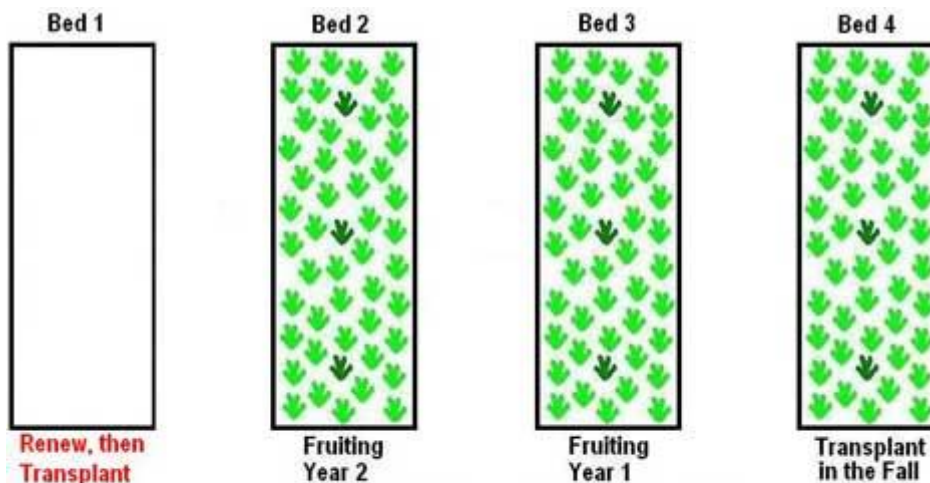
Transplant System, Year 3

Year 4: Renew the Bed Before Transplanting Strawberry Plants Again

The strawberry plants in bed 1 should have been removed after they were completely done producing fruit in year 3. As soon as that occurred, bed renewal should begin. Rich organic compost, aged manure, or other soil enhancers should be generously added and tilled in. Either organic or non-organic fertilizers can be added as well. Add rich organic matter 2-3 more times over the course of the spring and summer months of year 4. In year 4, beds 2, 3, and 4 will produce a harvest while bed 1 is being renewed. In the fall of year 4, transplant healthy runner plants from bed 4 back to bed 1.

As long as your plants remain disease-free, this system should provide ample harvests from three beds from strawberry plants in their prime production years. By re-planting in the same beds, you do have an increased risk of your strawberry plants succumbing to one of the various strawberry plant diseases, if one is introduced to any of the beds.

Once the transplant runner plants are in bed 1 again, the cycle restarts. Barring disease and assuming sufficient nutrients are re-introduced and combined with the soil to properly nourish growing strawberry plants, this system should theoretically sustain a 3-bed berry harvest indefinitely. The size of the beds is limited only by the gardener's ability to maintain them!



Transplant System, Year 4

Transplanting Strawberry Plants: Conclusion

Hopefully this guide to strawberry plant transplanting has helped you. You should now know why you should transplant strawberry plants, when you should transplant strawberry plants, how you should transplant strawberry plants, and that it is usually best to transplant strawberry runner plants that are young and healthy. If you need extra help remembering which plants are old and which are runners within a bed, you can always use the cheap white plastic label stakes or Popsicle sticks to mark individual strawberry plants.

Hopefully, the strawberry transplanting system described will help accomplish your strawberry producing goals as well. Good luck, and happy transplanting!

WHEN TO HARVEST

After a couple of years planting and caring for growing strawberries, you are ready for harvest! Strawberries should be completely ripened on the plant before harvesting. Most varieties should be left on the plant for one or two days after the strawberries have gained full color. Ultimately, however, you have to eat one to know if it is ready!

Strawberries are somewhat fragile and are easily damaged and bruised. Gentle hands and tender care should be used when picking them from the strawberry plants. To pick a ripe strawberry, release it using the fingernails of your thumb and forefinger to sever the stem directly above the berry instead of pulling on the strawberry itself. Cradle the berry in your palm as you pick it so that it doesn't fall and bruise or get dirty. The cap and part of the stem should still be attached to the berry. You can harvest your strawberries as often as every other day if you want to maintain ripe, high-quality fruits.

Strawberries should be dry when they are picked. Wet berries do not do well and will mold more quickly, and, unlike tomatoes, will not ripen after being picked. As soon as they are harvested, it is best to place unwashed strawberries in cool, dry, shady place (a refrigerator is best).

Strawberries are one of the first plants to fruit in the spring. The strawberry harvest is heralded as a good omen in many locations, and numerous Strawberry Festivals celebrate the little red berries all around the country. Picking your home-grown strawberries is rewarding and should be celebrated as well! The temptation, however, is to pluck the fruits before they are ripe and to rip the fruit off at the calyx. Both can be problematic. Review the ripeness spectrum in the picture below, and try to refrain from picking white-tipped or pale red fruits. Stick to harvesting berries that look like the ones at the right, and you'll enjoy sweeter, bioflavonoid-rich, high-Vitamin C strawberries.



When picking your strawberries, be sure to exercise patience and pick the fruits that look like the ones at the right end of the spectrum. Picking prematurely halts the development of the natural sugars, nutrients, and vitamins and will result in harder, tart or sour berries.

When it comes to actually separating the fruit from the plant, try not to grab the berry and pull. Ripe fruits will be damaged by this technique. Instead, use the nails of your thumb and forefinger to “snip” the stem holding the fruit. The freed berry will roll gently into your palm without damage.

HOW TO PICK STRAWBERRIES

Strawberry picking is most successful when the picker applies the minor technical aspects of picking strawberries to the task at hand. Here is how to pick strawberries:

1. Hold the stem of the strawberry at about one half of an inch above the berry between your thumbnail and index finger while cradling the fruit in your palm.
2. Sever the stem sever the stem with pressure from your thumbnail while slightly twisting the stem.
3. Allow the strawberry (including the cap and stem) gently roll down into your palm. If you are ambidextrous, use your other hand for strawberry picking at the same time using the same procedure.
4. Repeat step three until both palms are full of strawberries.
5. Gently place your handfuls of picked strawberries into your chosen container. Don't press the strawberries or heap them over five inches.
6. Repeat the entire process until you have accomplished your strawberry picking goals or are tired of picking strawberries.



HOW TO STORE YOUR STRAWBERRIES

At the end of winter each year, strawberry plants laden with flowers burst forth from thawed earth in response to the warming rays of the sun. Soon thereafter, new strawberries begin to change from hard green new fruits to ripening white and pink ones foretelling the harvest soon to come. When the deep red develops heralding the production of the nutritious bioflavonoids, picking time is right around the corner!



Whether you pick your own from a local farm or grow your strawberries, or even if you buy them in the store, it is important to store strawberries appropriately. This is what you need to know to stave off moldy strawberries and maximize the life of your berries (and your enjoyment of them!).

How to Store Strawberries

Strawberries mold quickly if left in normal, room-temperature conditions. In order to store strawberries effectively, temperature and humidity requirements should be met. The optimal temperature for storing strawberries is 32 to 36 degrees Fahrenheit (0 to 2 degrees Celsius). Additionally, the optimum humidity level for keeping freshness at a maximum is 90% to 95%. If the humidity levels drops below 90%, water loss and shriveling can occur.

It is best to utilize the crisper drawer of your refrigerator when storing. And, if the strawberries were purchased at the store in one of the plastic re-seal-able bins, be sure to close the lid when storing.

Strawberries have a short shelf life. Under optimal conditions, strawberries can keep for up to a week, depending on the ripeness of the strawberry when it was picked. It is important to NOT wash the strawberries until just prior to eating them. The additional moisture added to the surface of the picked fruits will hasten their demise into spoilage. Also, be sure to inspect carefully prior to buying from a store or supermarket.

Storing Strawberries: Conclusion

Spring means strawberries across the temperate world. If you still have strawberries left over after you have consumed the fresh berries to your heart's content, don't forget the many other uses for the wonderful red fruit.

You can take advantage of the many strawberry recipes available in *The Simply Sensational Strawberry Cookbook* to prepare mouth-watering delights for friends and family for any occasion. Or, you can freeze your strawberries and use them later, or preserve them in jams or jellies.



Regardless of how you use them, learning how to store strawberries after picking them will make a difference in their "shelf life" and the length of time you can enjoy them. Happy eating!

RENOVATING STRAWBERRY BEDS

Renovation is an important part of growing strawberries of the June-bearing variety in the matted row system. Since strawberry plants don't live forever, renovating right after harvest can keep them vigorous for up to five years as new runner plants are given the chance to replace old or weakened plants.

As an overview (more details will be provided following), when renovating, you should thin the plants in the rows to about 6 inches apart (5 to 6 plants per square foot is the maximum acceptable). Then, mow the tops of the plants to one inch above the crowns. Take special care not to damage the crowns. If the foliage is disease-free, rake the leaves and compost them or incorporate them into the soil. Fertilize with a balanced (10-10-10) fertilizer. Narrow the rows to between 12 and 18 inches by hoeing or tilling.

A good, aggressive renovation effort will see about half of the strawberry plants removed. After plant removal, work the mulch medium into the soil with a tiller. Since strawberries have a shallow root system, spreading a thin layer of soil (about a half inch) around the crowns can help facilitate new root development. Continue to water the plants at least 1 inch per week through September and maintain the planting as weed-free until it the first frosts. Allow early runner plants to root where they will until your desired row width is re-established. However, runners produced after September 1st will not have time to establish themselves and survive the winter, so they can and should be removed.

Whenever you begin to notice the growing strawberries losing vigor or struggling to maintain their vitality, or if your yields begin to decrease, you may have reached the end of your strawberry bed's lifetime. When this occurs, start over with new plants in a new area, or use the transplanting system discussed above to maintain vitality.

Strawberry Renovation

In order to maximize the production of June-bearing strawberry plants grown in the traditional matted row system, "strawberry renovation" should be undertaken after the strawberries have been harvested. By beginning strawberry renovation immediately after harvest is complete, multiple strawberry pests are more effectively controlled, other pathogens like leaf spot are contained or eliminated, and more strawberry runners will be formed and established causing the harvest for the next season to be larger.

The entire process of renovating strawberries should be completed by late July in most areas. It should be noted that most commercial strawberry producers have moved away from traditional matted row production, now use plasticulture, and grow strawberries as annuals instead of perennials. So, this guide to renovating strawberry plants will most likely be of benefit to home gardeners or small-scale strawberry growers. Additionally, the traditional methods used during the renovation of strawberry plants are not organic.



With that said, here are the 8 traditional steps used in strawberry renovating:

STEP 1: Weed Control in Strawberry Renovation

The first step in traditional strawberry renovation is chemical weed control. Broad leaf weeds are killed with Amine 4 or Formula 40 (both are brand names of the 2,4-D amine formulation). When using the herbicide, be very careful to precisely apply the chemical as it will cause damage to your strawberry plants as well. Grasses (most annual and perennial grasses) can be controlled with sethoxydin. However, don't mix the two herbicides in the same container. Spraying for weeds should commence immediately after the final strawberry harvest.

STEP 2: Mow 'Em

After applying herbicide to kill off the weeds, wait four or five days. Then, remove all the old leaves from the strawberry plants by mowing them off. They should be cut right above the crowns, but take special care to not cut too low and damage the crowns.

Strawberry plants are perennials. The fact that you can reap the benefits of your labor over the span of multiple years is a great benefit. However, to ensure that the strawberry plants survive the harsh conditions of the winter months, a little extra tender loving care is required. One aspect of the renovation process that confuses some people is the mowing strawberries part.

“Mowing strawberries! You must be kidding, right? You surely don't mean running over your strawberry bed with a lawn mower?!!” Actually, that is exactly what it means. And, hopefully, this information will help you understand how to mow strawberry plants and give you the confidence you need to begin mowing strawberry plants in your own garden.



Why Do You Need to Mow Strawberries?

Mowing strawberry plants serves several functions. As part of renovating strawberries, mowing helps increase the subsequent year's strawberry yield, extend the vitality of both the strawberry plants and planting area, and facilitates the rest of the renovation process. When the harvest ends, the growing season for the following year begins as flower buds and runners are produced.

The strawberry plant begins forming the buds that will turn into next year's flowers within the crown after the harvest has completed. These buds begin forming in late summer and continue forming until early fall. Mowing strawberry plants encourages them to develop more buds after harvest. This means more flower stalks the following spring, and, consequently, a higher yield. (Water is also crucial for flower bud formation. To ensure maximal production of strawberries in the following year, 1 inch of water must be applied to the strawberry plants per week until the first frost.)

When to Mow Strawberries

It is best to mow strawberry plants within one week after they produce their last harvest. Mowing strawberries after this week will likely result in damage to new foliar growth. No strawberry plants should be mowed after the first day of August. The flower buds will begin forming around the middle of August across most of the United States, and overhead strawberry leaves are needed. If a very late season variety was planted and harvesting is occurring in the last week of July, mowing probably should not take place.

Also, if the strawberry plants are thinly spaced within your garden or strawberry patch, either forego mowing the strawberries or raise the deck of the mower so that the strawberry runners won't be destroyed and will be able to root afterward.

Actually Mowing Strawberries

Mowing strawberries may sound drastic, but it is easy. Take your chosen rotary mower and set the deck so that it cuts a full inch above the strawberry plant crowns. Then mow over the plants. Easy as pie. As some varieties of strawberries are particularly sensitive to hot, dry weather, it is a good idea to water the plants prior to mowing. Jewel strawberry plants are particularly sensitive, and some plants may die after mowing a strawberry bed during hot and dry weather.

After mowing, rake up the debris and leaves and remove them from the garden. This helps air circulate and removes a hospitable environment for fungi and other strawberry plant pathogens. The moist or rotten leaves and congested areas are a haven for things that hurt strawberries, so rake soon after mowing.

Pruning Strawberry Plants and Alternatives

If you have a raised bed or unique gardening system that prevents running a mower over your strawberry plants, other alternatives can be substituted. Pruning strawberries can be done with any type of pruning shears or applicable scissors. Additionally, if skilled with a weed eater, they can be used also. However, due to the instability of your typical weed whacker, they aren't recommended. It is just too easy to permanently damage or kill your strawberry plants with an errant tilt.

If you prune strawberries with shears or scissors, it will take longer than mowing your strawberry plants. When trimming, cut about 1 inch above the crowns.

Benefits of Mowing Strawberries

1. Mowing strawberry plants as the first step in renovation makes the rest of the process easier. The beds will also appear more orderly.
2. Increase flower bud formation and next year's yield
3. Younger, non-rooted runner plants will be mowed off which helps prevent overcrowding
4. Increases the average size of strawberry collected from next year's harvest
5. Decreases opportunities for strawberry pathogens due to clearance of excess and/or dead foliage. Mowing can even break the disease cycle for some pathogens
6. Mulching is easier after mowing a strawberry patch
7. Planting new strawberry plants or transplanting runner plants is also easier after mowing, if needed

So, mowing strawberries is not all that complicated or difficult. However, it is important to remember two final things. First, crown placement is important and should be noted. If the crowns were not set properly at planting and are too high, the mower deck will have to be raised to accommodate them.

Also, the top part of the plants may look terrible after mowing. Fear not! The roots and crowns will be totally intact and happy and will continue producing delicious strawberries! And, if you have a raised bed or other difficult-to-mow area, remember that you can always prune strawberry plants by hand.

STEP 3: Fertilize the Strawberry Plants

The main goal of fertilization after mowing is to provide the strawberries with nitrogen to help re-grow a vegetative canopy. Between 25 and 60 pounds per acre should be applied, depending on the soil quality and vigor of the planting. Splitting the application into two smaller doses of fertilizer separated by about a month will increase the effectiveness of fertilizing. Once the strawberry plants have re-grown their leaflets, sampling them for testing can help direct fertilization more effectively by showing how well the plants are taking up nutrients from the soil.

STEP 4: Subsoiling

Subsoiling is the process of breaking up compacted soil beneath the topsoil and above the bedrock. After a season of growing strawberries, the harvesting process often yields highly compacted soil between the rows of strawberry plants. It is not vital to perform the tilling or breaking up of compacted soil layers at this point in the renovation process, but it is often a good fit after fertilization. Subsoiling allows for better water infiltration into the soil and, consequently, healthier and more vigorous plants.

STEP 5: Cutting Back Rows

Each row of planted strawberries should be cut back to between 12 and 18 inches. Strawberries are produced more heavily along the edges of a row. By cutting back the rows, more strawberries are produced. Air flow is also increased through the center of the rows. Sunlight and spray coverage is also better with narrower rows. A rototiller or cultivator should be used to cut back the rows, and the straw or mulch material should be cultivated into the soil simultaneously, if possible.

STEP 6: Post-Renovation Weed Control

It is common practice for preventative weed control steps to be taken following the renovation of strawberry plants. Many commercial operations will use 1/2 the annual rate of terbacil (Sinbar) at this time (4 oz per acre). Since this treatment can harm the strawberry plants, it is essential that they be mowed. For weak plantings, DCPA (8 to 12 pounds of Dacthal per acre) is preferred. If Sinbar is used, four to six weeks later an application of Devrinol (four pounds per acre) is called for in order to suppress winter weeds. During the summer months, the growth of strawberry runner plants will suppress weed growth at the edges of the rows, but shallow cultivation can destroy weeds in other places. Take care not to cultivate deeply in order to avoid strawberry root damage.

STEP 7: Water Application

Appropriate irrigation is necessary for both herbicide activation and growing strawberry plants. If the plants do not receive adequate water, they will become stressed. Ensure that the strawberries receive between 1 and 1.5 inches of water per week, either through rainfall or irrigation techniques.

STEP 8: Row Shaping/Runner Sweeping

The plant stand within the rows must be sufficient to produce well during the productive season following winter. Contain the plants within the rows and have them establish themselves as quickly as possible. Any

strawberry runner plant that is not rooted by the end of September should be cultivated into the soil or otherwise removed. If the plant has not established itself by October, it probably won't produce any strawberries the following spring. Such a plant is nothing more than a weed itself and should be removed, if possible, prior to winter.

A Final Note on Renovating...

Renovating strawberries maximizes fruit buds within the crowns of the strawberry plants. The buds (perennating flowers) that will turn into strawberry flowers and eventually strawberries the next spring are formed during August and September. Thus, it is imperative to provide strawberry plants with optimal conditions during these months. An additional 20 to 30 pounds of nitrogen can be added per acre of plants. And, even more importantly, adequate watering is required.

June-bearing matted row strawberry production is no longer en vogue among most of the larger commercial strawberry producers. Due to the specialized equipment that is required for plasticulture, however, a lot of smaller farms still perform strawberry renovation each year. The question does arise, though, if there is a better alternative. Traditionally, renovating strawberries causes a significant number of chemicals to be introduced into the strawberry field. And, in light of recent studies that show organic strawberry plants may be better and healthier, strawberry renovation may become less and less useful as better organic methods are developed.

PROTECTING STRAWBERRY PLANTS

Humans aren't the only creatures that like the tasty, sweet strawberries you will be growing. Birds and slugs (and other critters) love them too. Birds will inevitably get some of your strawberries. However, you can protect the vast majority of them by covering your rows with bird netting. Additionally, copper ribbon will keep the slugs away. Rabbits and squirrels and even wild turkeys can pose a significant problem for those in more rural settings. But, even more than the physical barriers that can be employed to keep critters away from your harvest, protection from Mother Nature is even more important.

If you want to continue growing strawberries from year to year, you have to preserve the bed and the strawberry plants in it. In areas with relatively warmer winters, your strawberries will likely not need much additional care to survive the winter. In colder climates additional mulching is required when the temperature drops into the twenties, but before it falls to 20 degrees Fahrenheit. Strawberry blossoms, however, are easily damaged by frost and will have to be protected in the spring if frosts are predicted.

For cold winters, wait until the strawberry plants go dormant. This usually happens in December when temperatures drop into the teens or low twenties and the top half inch of soil is frozen. Then, apply a mulch of straw or pine needles 2 to 3 inches thick over the bed. Other mulches that do not contain weed seeds can be substituted in a pinch, but it is best not use sawdust, leaves, or cut grass as they will pack too tightly and can smother the plants.

Watering the mulch lightly can help prevent wind loss. Additionally, don't apply mulch after several consecutive warm days. The mulch may spur the strawberry plants to begin growing again which will result in extensive temperature damage and even plant loss.

In the spring, rake the mulch off to the side so that the plants can begin growing again. However, keep it handy so that the plants can be re-covered when frosts are predicted. Old blankets or cloths or commercial materials like Reemay can be used to mitigate the threat of frosts as well. Leave the mulch around the base of the plants to keep the berries off the ground also.

Mulching Strawberry Plants with Straw for Winter

Mulching strawberry plants is a necessary step in the care of perennial strawberry care. For gardeners using the matted row system to produce strawberries, part of the process of growing strawberries involves strawberry renovation and preparation for overwintering strawberry plants as has been discussed previously. In milder temperate climates, minimal mulching is required as strawberries can withstand nominal freezing temperatures without much difficulty. However, if temperatures drop below 10 degrees Fahrenheit, the crowns will often sustain damage and fail to bloom the following spring.



One of the simplest and most common methods of protecting the strawberry crowns is to use a thick layer of straw mulch to cover and protect the vulnerable crowns during the cold of winter. It is relative easy to apply and serves several beneficial functions for your plants.

Benefits of Mulching Strawberry Plants with Straw for Winter

As already mentioned, the primary benefit obtained by straw mulching your strawberry bed is the prevention of cold injury. However, simple temperature control is not the only benefit of using a straw mulch (or other

mulch). Mulching appropriately also prevents frost heaving of the crowns. Additionally, the moisture content of the dormant plants is better maintained by preventing the winter winds from desiccating. And, perhaps most importantly, mulching helps reduce the risk of your plants developing black root rot. Black root rot is more common in plants that have developed susceptibility to it because of cold injury.

How to Mulch Strawberry Plants with Straw

In order to ensure that your plants are adequately protected, follow these steps:

1. Obtain clean straw. Oat, rye, or wheat straw are the best mulching straw types because it isn't heavy, is loose, and won't smother the plants. Leaves will form a dense, smothering layer, and hay usually contains a host of weed and grass seeds that will germinate in warmer weather and will compete with or choke out your strawberries. Using straw also reduces the chance of inoculating your bed with insect pests or other pathogens. One bale of straw will typically cover about 30 feet of 4-foot-wide matted row.

2. Choose the appropriate time to apply the straw mulch. The straw should not be applied until the strawberry plants have gone dormant for the winter. Otherwise, the plants might be smothered. Strawberry plants typically go dormant when the temperatures have dropped into the mid-20° F range for 3-4 consecutive days. Plants can usually be identified as dormant by the older leaves, which will turn brown first. The younger leaves will turn from a bright green to a dull green or gray color. It is best not to wait until the ground is completely frozen.

3. Apply the straw mulch to the strawberry plants. Once the plants are dormant, apply the mulch! Break up the bale and then break the flakes completely. Apply loose straw to the row of strawberry plants 3 to 6 inches deep. It is also good to cover any exposed soil between rows or in the planting.

4. Remove the straw before springtime. It is important to remove the straw mulch from the plants prior to them beginning to grow. Gently rake most of the straw off the plants and into the rows as soon as the top 2-4 inches of soil have warmed to 40 degrees. Leave a thin layer of straw over the plants. The plants will grow up through this thin covering, and it will also serve to keep the strawberries clean and minimize contact with the dirt beneath.

If cared for appropriately, strawberry plants will produce well year after year. In fact, with effective transplanting, your strawberries can keep replenishing themselves indefinitely! So, mulch appropriately. Straw is an excellent choice for mulching medium, although some people like to use shredded newspaper.

So, plan to give a little tender loving care to you strawberry bed, and your strawberry plants will reward you with numerous harvests to come!

More Information on Overwintering Strawberries...

Strawberries are a delightful treat for thousands of home gardeners every year. The sweet rush of flavor that comes after sampling the distinctive aromatic profile makes for a truly rewarding experience early in the growing season. Strawberries are one of the first fruits to be harvested in virtually every temperate region of the world, and the life cycle of the strawberry plant is uniquely suited to bearing an early crop.

Usually before spring even arrives, the strawberry plants are coaxed from their long winter's slumber by rising temperatures and burst forth from



dormancy in a fevered rush of vegetative production on their journey to setting a nice harvest of berries for the gardener who lavished care on them. But, in most areas, winter poses a real threat to the life of the little forbs as already discussed.

Mulching strawberry plants for winter protection for plants that are planted traditionally in the ground has just been reviewed above. But, that isn't the only way to plant the adaptable plants...

How to Overwinter Strawberries in Containers

Overwintering container strawberries takes a bit more effort than overwintering in the ground, but it is still easily accomplished. Added difficulty comes from the susceptibility of containers to heat transmission. Terracotta pots and strawberry planters (as well as plastic ones and the hanging Topsy Turvy planters) do not have the added protection of extensive amounts of insulating soil surrounding the potting soil and potted strawberry. Because of this, container strawberries are much more at risk of freezing to death outside and must be further sheltered from the elements during the biting cold of winter.



The easiest way to do this is to simply put the pot or container in an unheated garage near an internal wall. This will allow the dormant plant the protection it needs to survive. And, the prolonged darkness in the garage will actually help maintain dormancy. Covering with a towel or other opaque material can also help in that respect.

When the temperatures start to warm, simply take the containers back outside for the next growing season. The rising temperatures will revive the plants from dormancy, and production will commence again. If the plants must stay outside and exposed, it is best to wrap the pots or containers with several layers of an insulating material.

Watering Overwintered Strawberries

Your overwintered strawberries still have to have appropriate water. Totally dry soil means dead plants. Too much moisture can also be fatal. During the cold temperatures and while the plant is dormant, only minimal water is needed.

For outdoor, in-ground, and mulched overwintering strawberry plants, the natural precipitation should appropriately maintain sufficient soil moisture. For the container plants, however, water will have to be provided. The easiest way to provide appropriate water is to collect snow from outside and throw a handful or two on top of the soil. The slightly warmer temperatures in the garage should slowly melt the snow allowing a more natural seepage into the container soil. Doing this periodically (about once a month) should sufficiently moisten the soil and allow the plants to thrive again come spring.

There are numerous benefits to be had by overwintering strawberries. Here are some of them:

Overwintering Strawberry Plants Is Natural

Strawberry plants have a dormant phase for a reason. It increases their life span! Strawberry plants can be kept inside at warmer temperatures all year round, but this essentially causes the plants to never “sleep” and reduces the overall life span of the plant.

Overwintering Strawberries Maximizes Production

Strawberry plants are perennial by nature. Letting them go dormant during the winter as nature would have it allows for maximal production from each plant. Since strawberry flowers should be pinched during year one for spring plantings, the second, third, fourth, and even sometimes fifth years are where production really comes on strong. Protecting dormant plants during the winter yields much more production following.

Overwinter Strawberries to Save Money

If you overwinter strawberry plants successfully, you don't have to buy them again the following year. And, since they'll live longer, you don't have to replenish them as often either. Plus, since overwintered strawberry plants are more productive than plants that are never allowed to go dormant, you get to eat more of your own strawberries; and that means you'll be saving money by not buying strawberries at the grocery store or farmers market.

It Is Fun to Overwinter Strawberry Plants

And, lastly, it is just plain fun to overwinter strawberries! They don't suffer cold injury when you care for them appropriately, and it brings a true green thumb at least a modicum of satisfaction knowing that his plants are kindly looked after. So, save yourself the work of replanting new plants each year and overwinter strawberries henceforth.

Hopefully, you are now equipped whether you needed to know how to overwinter strawberries in containers or how to overwinter strawberry plants in the ground. Following the advice in this manual will help keep your plants productive year after year. So, have fun, save money, and maximize your harvest!



DEALING WITH COMMON PROBLEMS

Strawberry Plants and Cold Injury

One of the benefits of growing strawberry plants is that they don't die off every year. With appropriate care, they can live for many years, and they can survive very cold winter temperatures. These traits make strawberry plants hardy perennials.

As the temperatures drop in the fall or winter, strawberry plants undergo a transformation. They slow their cellular processes, move into a state of plant "hibernation," and are dormant until warmer temperatures return in the late winter or early spring of the next year.



When temperatures increase, strawberry plants revive and begin increasing their plant metabolism. But, a brief period of warmer temperatures can happen before the warmer weather is consistent. And, unfortunately, strawberry plants are susceptible to being damaged by cold temperatures if they are not prepared for them. When temperatures rise and revive dormant strawberry plants and then precipitously fall again, strawberry plants can suffer cold injury or "frost damage." This information will guide you through the process of determining the degree and significance of cold damage on strawberry plants in your garden.

Strawberry plants and cold injury are common partners. Any time a plant survives the winter months, the late winter fluctuations in temperature put such plants at risk of freeze damage. And, while some damage is common, it is important to determine the extent of such injury. A small amount of temperature-induced damage will not kill your strawberry plants or significantly decrease their strawberry production if the plants are otherwise healthy. So, determining the extent of any cold injury is critical. After a cold snap, it can be critical to check a sample of planted strawberry plants to determine an appropriate course of action. If extensive damage is found, replanting your strawberry beds may be necessary.

Checking Strawberry Plants for Cold Damage

If your region experiences a warm period followed by a significant drop in temperature (or significantly low winter temperatures), checking your strawberry plants may be in order. After the cold snap, wait a few days. Then, gather some simple tools.

Tools needed:

1. a small hand trowel
2. a piece of a 2×4 (or other hard surface)
3. a sharp and sturdy knife (a box cutter works well)

After you've gathered your tools, go to your strawberry bed. Use the trowel to dig a circle around the strawberry plants you are going to examine. You only need to inspect a few strawberry plants. After the circle is dug, gently lift the plants out, shake as much dirt and debris off of the roots as possible, and then cut or pull off all the leaves. All that should be left is the crown and some roots. Put the crown on your wooden block or other cutting surface. Then, carefully make a vertical slice from the leaf end down to the root end of the crown. This should cut the crown cleanly in half. The crowns will often be firm, so be careful when cutting as a slip with sharp cutting tools can cause personal injury.

Immediately upon completing the cut, inspect the strawberry plant. As soon as the inside of the strawberry crown is exposed to oxygen in the air, it will begin to oxidize and turn brown, so swift inspection is required. Waiting too long to inspect will result in difficulty accurately assessing the extent of strawberry damage.

When inspecting strawberry plants, look for brown discoloration within the whitish, ivory-colored inner crown tissue. If light brown discoloration spots are visible, the strawberry plant has suffered mild cold damage. Mild cold damage on strawberry plants is usually insignificant. The strawberry plants will adapt, heal, and continue their normal and productive lives.



Mild Strawberry Cold Injury

However, if brown streaks or significant browning are noted, the strawberry plants have suffered more extensive damage, and the strawberry plants may have to be replaced. Prior to digging up your entire bed and replanting, it is a good idea to wait a few weeks and recheck a sample of the plants. Upon recheck, if new white areas are developing within the crown, the strawberry plants will often recover. If there is no new white crown tissue, the plant is likely a goner. At that point, replanting the strawberries will be required.



Serious Strawberry Cold Injury

Wilting Strawberry Plants

More and more people are growing their own strawberries as a hobby or as ornamentals or for production in their home gardens. Few things are as frustrating as eagerly anticipating years of bountiful strawberry harvests and then watching the plants go from apparently healthy to wilted. Wilting strawberry plants can make even the most stolid gardener attempt to forcibly remove his own follicles in a fit of perplexity. Sometimes wilting strawberries can be salvaged if the underlying cause is discovered and remedied. Oftentimes, however, once the wilt sets in, there is little that can be done if it is caused by a pathogen.



For the sake of accuracy, it is good to distinguish between non-infectious wilting and blight. Both look similar and can be easily confused, but they are actually different. Blights can lead to wilting strawberry plants, but wilting is a symptom only. Wilting is evidence of a problem, but not necessarily a disease (blight).

Why Do Strawberry Plants Wilt?

Strawberry plants are forbs. This means that they lack the above-ground woody tissue that many plants have (like trees), but they are still vascular. Without the woody tissue, their stems cannot thicken and stiffen to support increasing vertical growth. Consequently, they are short and rely on turgor pressure to maintain an erect habit. At the cellular level, strawberry plants have cell walls. Turgor pressure is the pressure derived from the inner plasma membrane pushing against the outer cell wall due to osmotic forces. Water from outside the cell moves from an area of low solute concentration into the cell's vacuole, which has a higher solute concentration. This increase of water inside the cell causes the turgor pressure and the plants rely on this turgidity to maintain their rigidity (which gives them their normal shape and appearance). If they lose their turgidity, they lose their rigidity, and they wilt.

Causes of Wilted Strawberry Plants

There are numerous conditions that cause strawberry plants to wilt. This list does not purport to be exhaustive. But, if you are experiencing droopy plants that look to be dying, there is a good chance that one of the causes in the list below is at the root of your problem. If you can remedy the problem fast enough, wilting can and will reverse, and the plants will regain their vitality as turgidity is restored and proper function is attained again. These are the top 5 causes of wilting strawberries:

1. Drought causes wilting strawberries...

If your strawberries experience drought-like conditions, they will wilt. A continual supply of water must be transmitted from the roots upward and into the cells to allow osmosis to maintain turgor pressure and rigidity within the plant tissues. If no (or not enough) water is available, the droop will set in shortly thereafter.

2. Low temperatures cause strawberries to wilt...

Cold temperatures prevent the free flow of water through a strawberry plants vascular system. As with drought above, this results in insufficient water passage through the plant, the loss of turgidity, and the loss of rigidity. The plants will droop when the weather gets too cold to maintain proper cellular function. Fortunately, strawberry plants recognize this temperature shift and will go dormant instead of dying as most annual plants will. Then, when temperatures rise again toward the end of winter, the plant wakes again and sends forth new foliage that functions appropriately at the cellular level.

3. Strawberries wilt when in high-salinity environments...

Turgor pressure is the result of osmotic forces. Water will move across a semi-permeable membrane to the area of highest solute concentration. If the salinity of the surrounding environment is higher than that within the cell, the same osmotic draw that normally pulls water into the cell to maintain turgidity will work in reverse. As water is drawn from the cells and into the environment of higher solute concentration outside the cell, it will wilt.

4. Saturated soil causes wilting strawberries...

The process of moving water throughout a plant requires some energy. This energy is generated by the process of cellular respiration. If the soil is waterlogged, oxygen levels can drop to levels that do not allow the roots to respire. If this occurs, they will not be able to transport sufficient amounts of water up into the plant, even though there is an abundance of water. This over-abundance of water will not only prevent water flow into the plant and thereby cause wilting, but it also sets up the plant for the next cause of wilting. In other words, if drowning doesn't kill it, a disease probably will.

5. Wilting is part of the disease/infestation process...

Blighted strawberry plants will likely eventually wilt. When pathogenic fungi or bacteria manage to infect the tissues of a strawberry plant, wilting is often not far behind. The pathogenic organisms work their way into the structures of the plant and can clog the vascular system. Clogged vascular systems lead to poor water flow which leads to wilting which leads to death. Also, parasitic infestations can also cause wilting. As mites or other insects feed on the strawberry plants, their cellular structure loses its integrity. Water leaks out of the holes, and as the plants lose more and more water from the damaged areas, they wilt and eventually die.

A Final Word on Wilting Strawberry Plants

Unlike trees and other woody plants that have celluloid supporting structures to keep them erect even when problems are affecting them, strawberry plants readily demonstrate their infirmity when they are afflicted. Wilting is a sign that something is wrong. If you notice your plants looking sickly and wilting, take quick action to identify the underlying problem and rectify it as soon as possible. Wilting decreases the ability of your plants to transpire and grow, so if you don't remedy the cause of wilting quickly, your plants will die.

Wilting at its heart is all about water, as you may have noticed. Too much or too little or too salty and plants begin to struggle for life. Even when strawberry plants are infected with a bacterium or fungus, the pathogens typically kill indirectly as the water status of the plants at the cellular level is compromised.

Strawberry Plants Producing Runners but no Strawberries?

A common complaint of new strawberry growers is that their strawberry plants aren't producing strawberries. They have planted them, provided them tender loving care, and waited expectantly for them to return the "love" by setting a harvest of nice, plump, juicy strawberries.

And then no strawberries come. You may have lots of leafy greens and too many strawberry runners shooting out to count, but the strawberries themselves are sadly absent.



Here are the top 10 reasons your strawberry plants aren't producing strawberries. It is likely that your situation will fall into one of these:

1. Strawberry plants are too young

June-bearing strawberry plants will often produce few or no strawberries in the first year they are planted. This is, in fact, good for the long-term health of your plants and strawberry bed. The energy that goes into a strawberry is not insignificant for a young strawberry plant. Since strawberries are perennials that will produce a crop year after year, the best use of developmental energy is in establishing a strong, healthy root system and flower buds within the crown. The better root system will exponentially increase the nutrient uptake for the second year. And, those roots will be needed as the flower buds will turn into flowers that will turn into strawberries in year two. This is why it is important to pinch off strawberry flowers in year one as described previously in this manual. Doing this in year one allows development of more buds and better roots. This makes the plant healthy. The healthy plant will then set a much larger harvest than it otherwise would without them.

2. Your strawberry plants have diseases or parasites or both

There are a host of strawberry pests and pathogens that literally suck the life out of strawberries. In fact, you can view the most common ones below. If your strawberries have an infection or infestation, they may simply be too sick to produce strawberries.

3. Your strawberries are thirsty (or drowning)

Strawberries can be finicky when it comes to their water requirements. They have relatively shallow root systems. This causes them to absorb the vast majority of their water from the top several inches of soil. This is also the soil that dries out most quickly when the temperatures rise. Since strawberry plants require a significant and steady amount of water to produce well, constant drying out of the top layers of soil can cause the plants to go into "survival mode." They don't produce many or good quality strawberries in dry dirt (if they survive). Additionally, too much watering will halt plant growth and strawberry production. In fact, the strawberry crowns will rot, and the plants will die if they remain in standing water for too long. It is important to plant your strawberry plants in well-drained soil to prevent standing water from submerging any part of the strawberry plant.

4. Your strawberries aren't getting pollinated

Most of the common varieties of strawberry plants have hermaphroditic flowers, meaning they have both "male" and "female" parts. However, the flowers typically act as either male or female, not both. This means that pollen from one flower has to make it to another flower in order for the strawberry to form. So, if a strawberry plant is kept indoors in a window or outdoors on a screened in porch (or anywhere else where the pollinating insects won't be successfully drawn to your plant, you likely won't have many strawberries.

5. Your strawberry plants are starving

Strawberry plants are amazing. They can manage to eke out their existence in some of the harshest places on earth. In fact, one of my own crazy strawberry runners once rooted itself in the shelf of a cheap, pressboard bookshelf. It had nothing to eat other than wood chips and whatever glue they use to stick those things together. To my amazement, it survived and grew well. It actually was only an inch or so smaller than the other runner plants put out from the same mother plant. But, when the other plants fruited, this one did nothing. In fact, it didn't even produce a flower. All that to say: your strawberry plants need the right

nutrients. Without the appropriate organic components, the plant may still grow, but it won't provide you with any strawberries.

6. Your strawberry plants are high on NPK

Giving your strawberries too much food can also hurt strawberry production. The Nitrogen-Phosphorous-Potassium (NPK) fertilizers are generally formulated for specific growing purposes. Using fertilizers that are of the wrong concentrations for strawberry plants, or even using way too much of an appropriate fertilizer can decrease strawberry production. Often, the fertilizers cause excessive vegetative growth at the expense of strawberry production. After all, why should the strawberry plant worry about propagating itself via strawberry seeds if it has so many nutrients tickling its roots that it can't even think straight?

7. Your climate is wrong for strawberries

Most strawberries grown at the equator are grown at high elevations where it is cooler. I don't think it is possible for them to grow on Antarctica without serious human interventions. While a few populated places on earth are completely unsuitable for any type of strawberry growth, strawberries will grow just about everywhere else. If, however, the preferred combination of warmth and coolness is not attained, many varieties will not produce strawberries. Most strawberry cultivars do best when the days are warm to hot (but not scorching) and the nights are cool to slightly warm. This combination of warm days and cool nights will almost always result in the maximal strawberry production for almost any strawberry variety. If you live somewhere where it is too hot, the plants may still grow, but the strawberries may be sparse or absent.

8. Your strawberry plant variety is wrong for your climate

Strawberry breeding programs around the world are constantly trying to increase local yields by developing more suitable strawberry plants for specific regions. This goal is often attained. However, in creating specialized strawberry cultivars, some of the overall adaptability of these plants is bred out or lost. When that happens, the new cultivars are sometimes successful only in specific climactic regions. Buying a strawberry developed for Michigan strawberry growers, for example, may not grow well in southern Florida. When the plants don't thrive, they often don't fruit.

9. Your strawberry plants don't like their home

Strawberry plants will grow well in containers. If they are properly cared for, that is. Container strawberries often do not have sufficient soil. Their soil will dry out much more quickly than in-ground strawberry plants. Their roots can get too hot. If planted in nutrient deficient or poor strawberry-quality soil, the plants won't be happy. Regardless of whether a strawberry plant is planted in an inhospitable pot or inhospitable plot, the lack of a suitable home that results in any of the conditions above will diminish or eliminate berry production. Unhappy plants don't readily produce strawberries.

10. You've been duped, lied to, or are misinformed

Occasionally, nurseries that sell strawberry plants get their facts mixed up. If they sell a June-bearing strawberry variety to a customer wanting an everbearing variety so that they can have a decent crop toward the end of the season, the buyer will be frustrated when no strawberries come forth. Be sure to check the characteristics of the cultivar you want to plant to make sure it is what you think it is and that it will perform well in your climate.

So, if there are no strawberries on strawberry plants you have planted, or strawberry plants are producing runners but no strawberries, evaluate each of the 10 reasons above and see if they apply to your situation. If they do, remedying the problem will likely result in reaping a harvest!

Strawberry Plant Diseases

There are quite a few diseases that affect strawberry plants. The strawberry plant's leaves, roots, and fruit are all susceptible to a variety of problems, depending on the resistance of the strawberry plant cultivar being considered. This is a summary of the most common strawberry plant diseases:

Red Stele Root Rot

A strawberry plant's roots are damaged by red stele root rot (also known as Lanarkshire disease). The disease is caused by a fungus living in the soil, and its presence is confirmed in a strawberry plant that has a red core to its roots. The fungus is particularly prevalent in the northern two-thirds of the United States. Heavy clay soils with poor drainage that remain saturated with water during cool weather are most at risk. The fungus that causes red stele root rot is *Phytophthora fragariae*, and, once established, can remain alive for at least thirteen years (maybe longer), regardless of crop rotation.

Strawberry Plant Leaf Spot

Leaf spot is caused by the fungus *Mycosphaerella fragariae* and manifests as dark purple to reddish-purple spots on multiple parts of the strawberry plant. The round spots are usually between 1/8 and 1/4 inches in diameter and most easily seen on the leaves of an infected strawberry plant. However, the petioles, stolons, fruit stalks (pedicels), and strawberry caps (calyxes), and ripe strawberries can also be infected. The center of the spots eventually become almost white with tan or gray intermediate steps. The parts of the strawberry plant affected by this disease are the young, succulent ones.



Strawberry Plant Leaf Blight

The fungus *Dendrophoma obscurans* (also known as *Phomopsis obscurans*) causes leaf blight, and it typically does its damage after harvest. One to six enlarging, elliptical or angular blemishes will develop on the leaflets and growing up to one inch in width. The spots begin with a reddish-purple color. As they enlarge, they develop a dark brown center that is surrounded by a lighter brown area with a purplish border. This fungus almost exclusively attacks weaker, slow-growing plants and usually ignores youthful runner plants. *Dendrophoma obscurans* can also cause a spreading, pink, soft rot at the stem end of a strawberry.



Strawberry Plant Leaf Scorch

Leaf scorch is caused by the fungus *Diplocarpon earliana*, which attacks the strawberry plant's leaves, calyxes, petioles, runners, and pedicels. In the early stages, it looks like leaf spot. Later, the lesions develop black spots as the fungal fruiting bodies are produced, but, unlike leaf spot, the centers of the lesions will remain dark purple. Strawberry plant leaves with a severe infection will shrivel and appear scorched. Rarely the fungus will infect green strawberries causing reddish brown spots or flecks to be visible on the unripe fruit.

Strawberry Gray Mold

If a strawberry plant is infected by gray mold, fruit production is likely to be particularly devastated (expect 80-90% loss of both flowers and strawberries). It is caused by the fungus *Botrytis cinerea*, and wreaks havoc during rainy and cloudy periods just before or during harvest. Strawberries touching dirt, another infected or rotting strawberry, or dead leaves in dense foliage are most commonly affected. The fungus causes infections



that manifest as soft, rapidly-growing spots that are light brown in color. The fruit will dry out, darken, and become covered with a dust-like, powdery layer of fungus spores, which gives the gray appearance.

Strawberry Plant Leaf Variegation

Leaf variegation is a mysterious disease, and its cause is currently unknown. It also goes by many other names, including: June yellows, spring yellows, chlorosis, Blakemore yellows, and non-infectious variegation. The disease usually (but not exclusively) occurs in strawberry plants that have Howard 17 (Premier), Blakemore, or Auchincruive Climax cultivars in their plant ancestries. Affecting only flowers and leaves, the disease manifests on new leaflets in the spring as yellow or white streaks or spots and a puckering of the leaflet. While onset is unpredictable, the strawberry plant will progressively manifest worsening symptoms until it dies two to three years later as a dwarfed and unproductive shell of its former self.

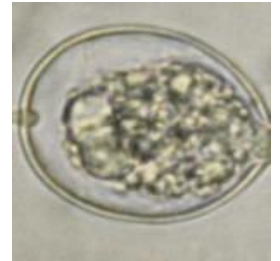
Verticillium Wilt of the Strawberry Plant

Verticillium wilt is caused by a very common soil fungus called *Verticillium alboatrum*. For new strawberry plantings, symptoms usually manifest as new runners are being produced. Older plantings are usually affected just before harvest. Affected strawberry plants will show different symptoms depending on the cultivar, and affected plants must be tested for definitive diagnosis. The symptoms are not easily distinguished from other strawberry plant root diseases or winter injury. Once established, the fungus will likely survive for 25 years or more.



Leather Rot (Crown Rot) of the Strawberry

Leather rot (also known as crown rot) is caused by the fungus *Phytophthora cactorum* and affects strawberries in poorly drained soils where there is or has been standing water. Most commonly, the fungus causes brown areas or brown outlines to form on green strawberries. The infected strawberries will have an unpleasant odor and bitter taste. Mature strawberries that are infected may look completely normal and taste terrible. Excessive rainfall in May, June, and July often create the optimal conditions for this fungal infection.



Strawberry Plant Pests

In addition to the strawberry plant diseases mentioned above, there are also numerous strawberry plant pests that can damage or kill your strawberry plants. Here is a summary of the common strawberry plant pests:

Strawberry Crown Borer (*Tyloderma fragariae*)

These strawberry plant pests are about 1/5 of an inch long and have three spots on their wing covers. They are flightless weevils that feed on strawberry plant crowns to open holes, into which they then lay their eggs through the middle of June. The hatched larva will bore into the crowns causing damage to the growing strawberry plant. The grubs will form a pupa and subsequently become a weevil to feed on the plant's leaves.

Strawberry Root Weevil (*Otiorhynchus ovatus*)

Root weevils are about 1/3 of an inch long and have wing covers distinguished by many rows of small pits. Adult weevils will lay eggs into the soil. Hatched larvae will burrow through the soil and feed on the roots and crowns of a nearby strawberry plant causing damage or death. The adult weevils will feed on the leaves.



White Grubs (*Phyllophaga*)

White grubs range from 1/2 to 1 inch and eventually become the large May or June beetles (also called "June bugs") common to many parts of the United States. The grubs burrow into the soil



and overwinter twice before taking beetle form. Consequently, the grubs can do damage to the roots of strawberry plants for multiple years as they feed.

Strawberry Rootworm (*Paria fragariae*)

Adult beetles are shiny, oval-shaped, dark brown to black, about 1/3 of an inch long, and display four blotches on their wing covers. Adults feed on the leaves through early fall and can cover strawberry plant foliage with holes. The larvae burrow into the soil and feed on the roots.

Strawberry Root Aphid (*Aphis forbesi*)

Also known as the strawberry root louse, this small strawberry plant pest is about 1 mm in length, has a oval and dark bluish-green body, and has a yellowish head. They feed on the roots and crowns of strawberry plants and can be quite numerous if infestation occurs.

Strawberry Leafrollers (*Ancylis comptana fragariae*)

The adult moths emerge in April or May to lay their eggs on the strawberry plant, usually on the underside of the leaflets. The translucent eggs then hatch and the larvae feed on the epidermis of the leaves, secreting silk threads as they go to tie the leaflets together. Other species of leafrollers also feed on the strawberry plant, but none of them usually cause significant damage to the overall strawberry planting.

Strawberry Mites (*Tetranychus urticae* and *Steneotarsonemus pallidus*)

The two-spotted spider mite and the cyclamen mite can wreak havoc on strawberry plants. The spider mites damage leaf surfaces in order to feed on sap, while the cyclamen mites feed on new, unfolding leaves and blossoms. Both will cause leaf death and drop, and the cyclamen mite causes distorted fruits.



Strawberry Clipper (*Anthonomus signatus*)

Also known as the strawberry weevil, these pests are about 1/10 of an inch long, dark reddish-brown, and have a long and slender, curved snout. The adults feed on pollen inside the almost-mature flower, subsequently laying an egg inside the flower. They then girdle the bud to prevent opening and clip the stem so that it hangs or falls to the ground.

Tarnished Plant Bug (*Lygus lineolaris*)

Also known as the Lygus bug, these strawberry plant pests are about 1/4 of an inch long and are distinguished by a yellow “V” marking on their back just behind the head. In the spring they feed on strawberry plant flowers which results in disfigured and knobby strawberries.



Slugs (*Agriolimax* and *Arion* species)

Slugs will eat deep holes into strawberries and leave slime trails over the strawberry plant. The damaged strawberries will begin to decay quickly. Slugs can do great damage to a strawberry harvest.



Birds

Birds will find a way to rob at least some of your strawberries from your strawberry plants before you are able to pick them. To minimize the loss, plant more strawberry plants than you need, and cover the area with bird netting to keep the thieves out as much as possible.

Nitrogen Deficiency in Strawberry Plants

Nitrogen deficiency in strawberry plants can cause rather significant problems for the longevity and vitality of strawberry patch. If your soil is low in nitrogen, you can expect consequences. This post will cover the basics of what to look for to determine whether or not your strawberries lack sufficient nitrogen-containing soil for optimal health and vigor.



What Indicates Nitrogen Deficiency in Strawberries?

In order to confirm nitrogen deficiency in strawberry plants, one ultimately must take a few tissue samples from affected leaflets that are “middle aged.” The leaflets that must be sampled cannot be the old ones toward the bottom of the plant or the new, bright green ones emerging from the crown.

Once samples are collected, they must be tested for average composition. The baseline measurement for nitrogen sufficiency is 2.6% to 2.8%. Should the measured percent composition of nitrogen be below 2.6% for the tested sample, it is very likely that the soil is nitrogen deficient, resulting in less-than-acceptable levels of nitrogen in the foliage tissue of the strawberry plants.

Strawberry Plants with Yellow Leaves

The old agricultural rule of thumb is that strawberry plants with yellow leaves indicate nitrogen deficient soil. However, while purple leaves often indicate a phosphorus deficiency, nitrogen deficiency can also cause purple leaves in addition to strawberries’ yellow leaves.

Yellow Strawberry Plant Leaves – Why?

A nitrogen deficiency is manifest (and consequently visualized more easily) in the middle-aged leaves. The yellow strawberry plant leaves occur in these middle-aged leaves, primarily, and not the new, still-green leaves emerging from the crown. This is due to two factors.

First, nitrogen is a component in many amino acids. In plants that lack this vital nutrient, proper amino acid synthesis is unable to be completed. The lack of amino acids yields the discolorations. Additionally, purple strawberry leaves can also be attributed to nitrogen deficiency (instead of the more common phosphorus deficiency causing the purple leaves) when carbohydrates build up in the plant tissues due to problems with amino acid deficiency.



Second, the young leaves emerging from the crown exacerbate the deficient state of the middle-aged leaves by appropriating for themselves the nitrogen that otherwise would have been used in the older leaves. Due to the demand of metabolism and synthesis of the newly emerging foliage, nitrogen will be mobilized from the middle-aged leaves to the new ones. This leads to more severe color changes in those leaves, depending on the overall severity of the nitrogen shortage.

If your strawberry plants have yellow leaves, the chances are good that they also have nitrogen deficiency. While not the only cause of yellow leaves (multiple other diseases can cause yellow or yellow-spotted leaves), it

is surely a good idea to determine if your soil is lacking this crucial component. With the multitude of organic nitrogen fertilizers available today, the problem should be fairly easy to remedy

MONTHLY GROWING STRAWBERRIES GUIDE

There is a tremendous amount of detailed information presented above in The Strawberry Growing Master Manual. For anyone just starting out, it is recommended that you start at the beginning and work your way through. However, it can also be useful to step back and look at the big picture when it comes to growing strawberries.

This guide is intended to give you a general idea of what it takes to properly care for growing strawberries and dormant strawberries all year long. It is an overview and will be accurate for most of the United States. The deep south and far north will have somewhat different seasonal benchmarks due to climate. However, the same general steps will be taken, albeit at a modified time.

Growing Strawberries Guide: WINTER

January: Select and order the varieties of strawberry plants you desire to plant. Be sure to order certified, disease-free plants. Most nurseries will not ship immediately when you order, but will ship at the appropriate time for you to plant according to your location.

February: Fertilize the soil and add lime 2 weeks prior to planting new plants (as soil testing dictates). Plant your strawberry plants if you live in a milder climate. Fertilize established strawberry beds. Apply straw or other mulch to your new strawberry beds when you plant them, either in February or March.

March: Plant your disease-free plants. For maximal production in subsequent years, remove blossoms in year 1. Pay attention to the weather forecast and protect blooms from frost, if needed.



Growing Strawberries Guide: SPRING

April: Remove the previously applied mulch covering from established beds. Cultivate and water. Protect blossoms from any late frosts. Control any strawberry pests. Continue to remove any blossoms on new plants.

May: Cover plants with bird netting to minimize loss. Water strawberry plants if conditions are dry. Continue to remove any blossoms on new plants. Begin harvesting strawberries every other day as they ripen on older plants. Control weeds. Train the strawberry runners wherever you want them to go.

June: Control any strawberry pests. Water strawberry plants if conditions are dry. Harvest ripe strawberries. Continue training the runners. Weed control. Begin renovating old strawberry beds after harvest and fruiting is finished for June-bearing varieties.



Growing Strawberries Guide: SUMMER

July: Control any strawberry pests. Water and cultivate. Fertilize, if needed.

August: Control any strawberry pests while specifically checking for mites. Fertilize in the middle of the month. Water strawberry plants if conditions are dry.



September: Control any strawberry pests. Water the strawberry plants. Fertilize in the middle of the month. Thin the plants to about four per square foot. Have the soil tested to guide future fertilization and to check for pests (specifically nematodes).

Growing Strawberries Guide: FALL

October: Water strawberry plants if conditions are dry. If you will be planting a new strawberry bed, prepare the ground. Target a pH of 5.8 for best results.

November: Either purchase mulch to have on-hand, or locate a supply of mulch than can be obtained once the ground freezes.

December: Liberally apply mulch to strawberry bed once the ground has frozen.

Growing strawberries can be very rewarding. However, it can be easy to forget what needs to be done when. This is especially true after the harvest is over and the thrill of watching fruits and vegetables fades into dormant or dead garden plants and trees. So, use this guide to keep you on track and think about picking strawberries from healthy plants during the next harvest!



Appendix A:

SPECIAL REPORT #1:

Jam Secrets

Hopefully, your strawberry plants produced abundantly this year and will for many years to come. One of the favorite strawberry-related summer traditions is the production of strawberry freezer jam. Making freezer jam is an art in its own right, but these secrets can help you be a successful (and healthy) canner of jams.



Strawberry freezer jam is considered to be a member of the strawberry preserves family, and the instructions for preserving are quite important to follow carefully to ensure that the canned freezer jam won't pose a health risk to those who consume it later. However, when instructions are given, it is important to factor in the altitude at which the cans will be boiled (in a water bath canner).

As altitude increases, pressure decreases. When atmospheric pressure decreases, the boiling point of water decreases. This means that water will boil at a lower temperature. Since high, bacteria-killing temperatures are required to ensure that the substances being canned are safe to store, water must be boiled for longer periods at high altitudes to ensure the same effect that boiling at lower altitudes achieves in less time. So, here is what you need to know:

Boiling Times for Strawberry Freezer Jam

Follow whichever recipe you choose for your strawberry freezer jam. Prior to placing the jars in the water bath canner, look up your altitude (you can also check with your county extension agent for this information, or you can use <http://earthtools.org>). Once you know your altitude, use this simple chart to add time to the recommended boiling time as your elevation dictates:

Jar size	Processing time (minutes) at various elevations		
	0–1,000 ft	1,001–6,000 ft	above 6,000 ft
Half-pint or pint	5	10	15

Boiling Times for Strawberry Freezer Jam

Of course, strawberry freezer jam is so delicious, you'll probably not see it still on the shelf after a year anyway! But, just in case you do, ensuring that adequate temperatures were attained while boiling will allow you to store your jars of strawberry freezer jam on a cool and dark shelf for up to five years.

How to Vacuum Seal Your Jars of Strawberry Jam

Did your strawberry plants produce abundant strawberries this year? Hopefully so! Whether you grow your own, go strawberry picking, or buy them at the store, many people take time to prepare enough strawberry jam to last them through the winter until spring brings revived strawberry plants and another harvest.

Strawberry jam is not quite the same as a fine wine or expensive cheese. Strawberry jam has a limited shelf life. Eating strawberry jam that is a decade old will likely be hazardous to your health. In fact, I wouldn't recommend eating strawberry jam that has been on the shelf for five years.

But, there is one simple (and a little bit fun) secret that can extend the life of your canned strawberry goodness quite a bit. I'll give you a hint: the secret strawberry jam tip involves a fiery furnace...

Ok, well, maybe not a fiery furnace, but it does involve fire. So, if you are not capable, trained, experienced, and brave, don't try this at home.

When fire burns, it consumes oxygen as it turns some combustible material into energy (heat). Using fire, one can vacuum seal his jars of strawberry jam. Removing the oxygen inside a sealed jar usually prolongs the shelf life of whatever is in the jar. So, here is what you need to know:

Follow whichever recipe you choose for your strawberry jam. Prior to putting the lid on and sealing it, add a tablespoon of a combustible alcoholic beverage (vodka, gin, whiskey, etc.) to the top of the jam. Light the alcohol and quickly close and seal the lid. The fire will consume the alcohol and the oxygen leaving you with a vacuum seal that will help extend the life of the strawberry jam.

Enjoy!



Appendix B:

SPECIAL REPORT #2:

Best Strawberry Varieties for Making Wine

The Best Strawberries for Making Strawberry Wine

Every now and then, an adventurous soul will decide to start making strawberry wine (you can learn about making strawberry wine on pages 33-34 of this cookbook). Invariably, one of the first questions asked is, “What are the best strawberries for making for making strawberry wine?” After all, it all begins with the strawberries!



Best Strawberries for Wine: Background

Strawberries are uniquely suited for making “consume-me-now” wines. Unlike wines made from grapes, aging doesn’t improve the body of many strawberry wines. Additionally, the relatively high sugar content of virtually all strawberries makes most strawberry varieties suitable for wine making. Grapes, on the other hand, are highly variable. Some grape varieties are noble, and some are, well, not. By no means are all grapes equal when it comes to wines. And, to be fair, all strawberries are not equal either; it is just that the variability is much less, making most strawberry varieties acceptable choices.

The Best Strawberries for Making Strawberry Wine

When it comes to making a preeminent dessert wine, no strawberries compare to the two red, full-flavored wild-type strawberries: *Fragaria virginiana* and *Fragaria vesca* (aka Alpine strawberries). You can find these plants for sale [here](#) and [here](#).

Each wild strawberry species carries with it a truly intense flavor and aroma, and, if you can grow enough of them, makes an exquisite wine. Unfortunately, there are a few reasons these powerful berries don’t find themselves in wine bottles very often. Compared to modern cultivars, these plants produce only a small yield of small strawberries. So, while they may be the best strawberries for wine making, beverages made with them tend to carry an exquisite price tag to match their exquisite body. A good choice for a wine-making strawberry that falls somewhere between the wild strawberries and the typical run-of-the-mill variety is the aromatic [Mara des Bois](#). It is good for making wine, and it is commonly used for that purpose in Europe. A newer variety released in March of 2012 also holds much promise for wine-making: [Purple Wonder](#). It is, by far, the deepest-colored strawberry on the market, and also has an excellent aroma.



Strawberry Wine Making: Next Best Varieties

While not the penultimate best strawberries for making strawberry wine, several June-bearing cultivars have come to be the “best choice” for most individuals and wineries looking to produce a significant quantity of high-quality and affordable strawberry wine. While whichever June-bearing variety that grows well in any given climate will do reasonably well as a wine strawberry, the varieties that have assumed the mantle of

tradition as good wine making strawberries are Albritton, [Cardinal](#), [Dunlap](#), [Earliglow](#), [Sparkle](#), and [Sweet Charlie](#).

Best Strawberries for Making Strawberry Wine: Wine Strawberry

In conclusion, virtually any strawberry will make a decent strawberry wine. So, in that sense, every strawberry can be a wine strawberry! If you every have the chance to cultivate the wild strawberries, take advantage of it. While unmistakably strawberry, they will truly delight your palate in a way no strawberry has before (whether eaten raw or used to make a beverage). If you can't obtain enough of said strawberries to make wine, the other strawberry varieties are the next best wine strawberries and will surely not fail to please.

Good luck!

Appendix C:

SPECIAL REPORT #3:

Strawberry Buying Guide

Didn't Plant Any Strawberry Plants?

If you have even half of a square foot of dirt, you can plant your own strawberry plants and reap your own fresh-picked strawberry harvest. But, life is busy, and most people will end up buying their strawberries off the shelf at a grocery store. This special report is a guide for picking strawberries off the shelf and will help you make the most of your strawberry purchases!

Strawberries Are on Strawberry Plants before They Reach the Shelf!

When purchasing strawberries at a grocery store, it is important to understand from where the strawberries came. They were, of course, most likely grown on strawberry plants in a field somewhere. It is unlikely that the strawberry variety (the specific cultivar) will be listed on the packaging. It is also unlikely that all of the methods used to grow the strawberries will be listed anywhere. That's too bad, but that is the reality of the situation.



Knowing the practices used to grow the strawberry plants and which of the strawberry varieties was grown can give an educated shopper a good idea as to the taste and quality of the strawberries on the shelf. Additionally, the time of year, soil conditions, and weather conditions can also affect taste and strawberry quality.

For example, if you are buying fresh strawberries that were grown in California during the short-day season (winter), it is likely that you are either getting Camarosa strawberries, Ventana strawberries, or one of the newer cultivars, Benicia or Mojave strawberries. Similarly, you can expect to get differing strawberry flavors and nuances depending on when and where you buy strawberries. Usually, a farmer will be able to tell you exactly which cultivar of strawberry plants he planted to produce his strawberries.

Just remember, not all strawberries are created equally. Buying similar-looking strawberries in the same packaging from the same location at two different times during the year will almost certainly mean you are buying different strawberry varieties that will have differing flavor profiles. If you really want to find additional information about the strawberries you purchase, you can run the numbers through the UPC codes table below to glean more information.

How Clean Are Strawberries?

The Environmental Working Group compiles testing results for many common fruits and vegetables annually. This data is then used to make a list of the 15 cleanest and 12 dirtiest ones. Sadly, strawberries prove to be quite contaminated virtually every year. They seem to have a permanent spot in the "Dirty Dozen" list. In fact,

a single sample was contaminated by 13 different pesticides. Overall, 53 different pesticides were discovered on or in the strawberries we all love to eat. For more details, visit the [EWG](#).

Consuming pesticides is not recommended. Doing so has been linked to nervous system problems, disordered hormonal balance, irritation of the skin, lungs, and eyes, and even cancer.

So, how clean are strawberries? Usually not very, if you buy them at the store. Even though they are usually more expensive, reaching for the organically grown strawberries will likely be better for long-term health. That is just something to consider when picking strawberries off the shelf.

Strawberry Freshness Matters

Strawberries have a notoriously short shelf life. If you buy strawberries, you will need to use them quickly or they will become moldy and start to decompose. Some grocers may keep old strawberries that don't sell well on the shelf longer than they should. If there is any doubt as to the freshness of the berries, steer clear.

When Is a Strawberry Ripe?

Strawberries are ripe when the entire strawberry is evenly red. Ripe strawberries will have a higher sugar content and better overall taste profile than immature strawberries. Usually, you won't find any grossly unripe or green strawberries in a package purchased from a grocery store. The commercial growers have an evaluation system that does a pretty good job of culling the unfit strawberries before they get packaged.

But, do examine the tips of the strawberries. The strawberries should be red all the way to the very tip of each berry. If the very tip of a strawberry is white or greenish, it means the strawberry was picked slightly before it was ready and will likely be slightly (or not so slightly) tart. Remember that strawberries do not ripen once picked like tomatoes and some other fruits and vegetables do. So, if it is unripe when picked and packaged, it will be unripe when you eat it. Look for the containers that have the most evenly colored strawberries and the fewest (if any) white tips. They will taste better and have a higher nutritional value compared to the unripe ones.

Additionally, if you do see a green strawberry or obviously small, disfigured, or suspect strawberry, either get a different container or steer clear of the strawberries of that brand altogether. If a commercial operation fails to catch and cull such undesirable strawberries, their quality control mechanisms have malfunctioned. It is best to avoid produce from companies with malfunctioning quality control.

Are the Strawberries Whole?

Any decomposition likely means that the strawberries have exceeded their shelf life and have "expired." If you see mold in the container or on strawberries, don't buy it. Some people claim that mold can do horrendous things to you. Whether or not that is true, I doubt eating mold will work wonders for your health. If you see any visible signs of mold in a package, it is likely that mold spores have already spread throughout, so avoid that batch altogether.

Inspect the strawberries to ensure that they have their green caps and are generally whole. If the caps have been removed or torn off, or the berries are damaged, they are likely losing their nutritional benefits as you inspect them. When the cells of the strawberry are torn or damaged, an enzyme, ascorbic acid oxidase, is activated which then begins destroying the Vitamin C in the strawberry. Of course, this won't hurt you. But, if you have the option, why not select strawberries that have their full nutritional component intact?

Strawberries are very nutritious in their natural state. In fact, some exciting new research indicates that one of the compounds in strawberries may even help prevent cancer. So, if you can't bring yourself to buy a few strawberry plants and grow your own strawberries, use this guide to get the most for your money. In summary:

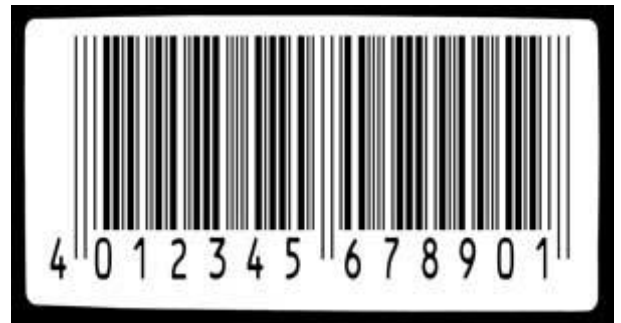
1. Realize environmental factors affect taste and quality of strawberries
2. Buy organic, if you can afford it
3. Ensure the strawberries are fresh
4. Verify ripeness and consistent quality of the fruits
5. Look for damaged or moldy strawberries
6. Congratulate yourself for knowing how to buy strawberries in a grocery store and buy the winning carton!

Then, once you have taken the prize back home for consumption, ponder whether or not you can grow your own strawberries next year! The information on UPC codes below can help you glean additional information about your chosen strawberries, if you choose to jump into such an endeavor.

Strawberry UPC Codes

Most store-bought packages of strawberries do not provide a lot of detailed information on the strawberries themselves. They usually have a brand name, price tag, and logo. If you want to find out the origin of strawberries you are buying, you'll likely have difficulty.

However, there is a way to find out more about the details and location of the strawberry plants that produced the strawberries you buy in the store: decode the UPC code! Using the UPC code from the package and the table here provided, you can find out some valuable information regarding where the strawberry plants were planted, some information about specific varieties, and other information as well.



How to Use the Strawberry UPC Codes Table

To use the table, you first have to identify the numbers at the bottom of your strawberry package. Find the bar code or UPC code on the package (the vertical black lines that the scanners read). At the bottom of the bar code there should be numbers. The numbers are what you will need here.



To find out additional information about strawberries you purchase, match the number on the package with the number in the left-most column in the table below. The rest of the entries in the row will provide more details about the strawberries you bought.

Strawberry UPC Codes List

Item # (UPC Code)	Commodity	Type/Variety	Growing Region	Grade	Package Size/Type
033383-20000	STRAWBERRY	ALL VARIETIES	CALIFORNIA		1/2 PINT CONTAINER
033383-20001	STRAWBERRY	ALL VARIETIES	CALIFORNIA		PINT CONTAINER
033383-20002	STRAWBERRY	ALL VARIETIES	CALIFORNIA		QUART CONTAINER
033383-20003	STRAWBERRY	ALL VARIETIES	CALIFORNIA		1/2 FLAT CONTAINER

Item # (UPC Code)	Commodity	Type/Variety	Growing Region	Grade	Package Size/Type
033383-20004	STRAWBERRY	ALL VARIETIES	CALIFORNIA		FLAT CONTAINER
033383-20005	STRAWBERRY	ALL VARIETIES	CALIFORNIA		8.8 OZ/250 G PUNNETT CONTAINER
033383-20026	STRAWBERRY	ALL VARIETIES	CALIFORNIA		8 OZ CONTAINER
033383-20027	STRAWBERRY	ALL VARIETIES	CALIFORNIA		1 LB CONTAINER
033383-20028	STRAWBERRY	ALL VARIETIES	CALIFORNIA		10.3 OZ PUNNETT CONTAINER
033383-20029	STRAWBERRY	STEM	CALIFORNIA		FLAT CONTAINER
033383-20030	STRAWBERRY	ALL VARIETIES	CALIFORNIA		2 LB CONTAINER
033383-20031	STRAWBERRY	STEM	CALIFORNIA		1 LB CONTAINER
033383-20032	STRAWBERRY	STEM	CALIFORNIA		8 OZ CONTAINER
033383-20033	STRAWBERRY		OTHER AREAS		1 LB CONTAINER
033383-20034	STRAWBERRY	ORGANIC - ALL VARIETIES	CALIFORNIA		8.8 OZ CLAMSHELL
033383-20035	STRAWBERRY	STEM	CALIFORNIA		1/2 FLAT CONTAINER
033383-20036	STRAWBERRY	ALL VARIETIES	CALIFORNIA		4 1/2 LB CLAMSHELL
033383-20037	STRAWBERRY	ALL VARIETIES	CALIFORNIA		4 LB CONTAINER
033383-20038	STRAWBERRY	ORGANIC - ALL VARIETIES	CALIFORNIA		1 LB CONTAINER
033383-20039	STRAWBERRY	ORGANIC GREENHOUSE	FLORIDA	U.S. 033383-1	8 OZ CONTAINER
033383-20040	STRAWBERRY	ORGANIC GREENHOUSE	FLORIDA	U.S. 033383-1	1 LB CONTAINER
033383-20041	STRAWBERRY	SABROSA	CALIFORNIA		1 LB CLAMSHELL
033383-20042	STRAWBERRY	SABROSA	CALIFORNIA		2 LB CLAMSHELL
033383-20043	STRAWBERRY	SABROSA	CALIFORNIA		4 LB CLAMSHELL
033383-20044	STRAWBERRY	ORGANIC	CALIFORNIA		2 LB CLAMSHELL
033383-20045	STRAWBERRY	ORGANIC LONG STEM	CALIFORNIA		1 LB CLAMSHELL
033383-20046	STRAWBERRY	ORGANIC - ALL VARIETIES	CALIFORNIA		4 LB CONTAINER
033383-20047	STRAWBERRY		ALL AREAS		12 OZ CLAMSHELL
033383-20048	STRAWBERRY		ALL AREAS		18 X 4 OZ CLAMSHELL
033383-20049	STRAWBERRY		ALL AREAS		3 X 4 OZ CLAMSHELL
033383-20050	STRAWBERRY		ALL AREAS		4 OZ CLAMSHELL
033383-20100	STRAWBERRY	ALL VARIETIES	FLORIDA		1/2 PINT CONTAINER
033383-20101	STRAWBERRY	ALL VARIETIES	FLORIDA		PINT CONTAINER
033383-20102	STRAWBERRY	ALL VARIETIES	FLORIDA		QUART CONTAINER
033383-20103	STRAWBERRY	ALL VARIETIES	FLORIDA		1/2 FLAT CONTAINER
033383-20104	STRAWBERRY	ALL VARIETIES	FLORIDA		FLAT CONTAINER
033383-20105	STRAWBERRY	ALL VARIETIES	FLORIDA		8.8 OZ/250 G PUNNETT CONTAINER
033383-20126	STRAWBERRY	ALL VARIETIES	FLORIDA		8 OZ CONTAINER
033383-20127	STRAWBERRY	ALL VARIETIES	FLORIDA		1 LB CONTAINER
033383-20128	STRAWBERRY		FLORIDA		2 LB CLAMSHELL
033383-20129	STRAWBERRY	STEM	FLORIDA		1 LB CLAMSHELL

Item # (UPC Code)	Commodity	Type/Variety	Growing Region	Grade	Package Size/Type
033383-20130	STRAWBERRY	STEM	FLORIDA		8 OZ CLAMSHELL
033383-20131	STRAWBERRY	ALL VARIETIES	FLORIDA		4 LB CONTAINER
033383-20132	STRAWBERRY		OTHER AREAS		2 LB CLAMSHELL
033383-20200	STRAWBERRY	ALL VARIETIES	OTHER AREAS		1/2 PINT CONTAINER
033383-20201	STRAWBERRY	ALL VARIETIES	OTHER AREAS		PINT CONTAINER
033383-20202	STRAWBERRY	ALL VARIETIES	OTHER AREAS		QUART CONTAINER
033383-20203	STRAWBERRY	ALL VARIETIES	OTHER AREAS		1/2 FLAT CONTAINER
033383-20204	STRAWBERRY	ALL VARIETIES	OTHER AREAS		FLAT CONTAINER
033383-20205	STRAWBERRY	ALL VARIETIES	OTHER AREAS		8.8 OZ/250 G PUNNETT CONTAINER
033383-44565	STRAWBERRY		CANADA		2 LITRE CONTAINER
033383-44566	STRAWBERRY		CANADA		4 LITRE CONTAINER
033383-44567	STRAWBERRY		CANADA		8 LITRE CONTAINER
033383-46320	STRAWBERRY		CANADA		6 X 1 PINT FLAT
033383-46321	STRAWBERRY		CANADA		12 X 1 PINT FLAT
033383-46322	STRAWBERRY		CANADA		4 X 1 QUART FLAT
033383-46323	STRAWBERRY		CANADA		6 X 1 QUART FLAT
033383-46324	STRAWBERRY		CANADA		8 X 1 QUART FLAT
033383-46325	STRAWBERRY		CANADA		3 LITRE CONTAINER
033383-46532	STRAWBERRY		CANADA	CANADA 033383-1	1.5 LITRE CONTAINER
033383-46546	STRAWBERRY		CANADA	CANADA 033383-1	2 LB CONTAINER
033383-46550	STRAWBERRY	ORGANIC - ALL VARIETIES	ALL AREAS		FLAT CONTAINER

Strawberry Codes: Conclusion

It can be both entertaining and enlightening to know more about what you are eating. By using the strawberry bar codes table, you may find that your strawberries have traveled quite a way to be eaten by you! But, before even going to the store to buy your berries, do a little reviewing. This strawberry buying guide will help you pick the best strawberries every time!

Appendix D:

SPECIAL REPORT #4:

Medicinal Uses of Strawberry Plants

The various parts of strawberry plants have long been used in numerous herbal remedies or traditional medicines. From tinctures to strawberry tea, the medicinal uses of strawberry plants and strawberries have quite a history. What is not known by most strawberry enthusiasts is just how extensive the potential uses of strawberry plants are.

Here you will find a listing of the chemical activities of strawberry plants. The table below provides a list of all 721 known biological activities of the various strawberry plant chemicals and compounds.

The medicinal uses of strawberries would be synonymous with the first column. The parenthesis indicates how many components in the strawberry plant are known to have that biological activity characteristic. The specific compounds that have the action are then listed next to the activity.

Additionally, before accessing the table below, read this **WARNING**: the use of this table is not intended to be used to diagnose, treat, cure, or prevent any disease or condition. None of the compounds in strawberry plants listed in this table have been approved or evaluated by the FDA for safety, efficacy, or accuracy. This data is intended for educational and entertainment purposes only.

The following table is arranged alphabetically by biological activity. To search for a particular compound, press and hold the Ctrl button and then press the F key to use the find function.

Medicinal Uses of Strawberry Plants

Biological Activity

11B HSD Inhibitor (2)

5 Alpha Reductase Inhibitor (6)

5 Lipoxygenase Inhibitor (2)

ACE Inhibitor (5)

AP 1 Inhibitor (1)

ATPase Inhibitor (1)

Abortifacient (1)

Acaricide (1)

Acarifuge (1)

Acidulant (1)

Acnegenic (1)

Compounds Possessing Activity

KAEMPFEROL, QUERCETIN

ALPHA LINOLENIC ACID, LINOLEIC ACID, OLEIC ACID, PALMITIC ACID, PALMITOLEIC ACID, STEARIC ACID

KAEMPFEROL, QUERCETIN

ALPHA TERPINEOL, ELLAGIC ACID, GALLIC ACID, QUERCITRIN, ZINC

SELENIUM

QUERCETIN

ELLAGIC ACID

LINALOOL

SULFUR

ASCORBIC ACID

IODINE



Biological Activity

Adjuvant (1)

Aldehyde Oxidase Inhibitor (1)

Aldose Reductase Inhibitor (11)

Allelochemic (6)

Allelopathic (3)

Allergenic (13)

Alpha Amylase Inhibitor (1)

Alpha Glucosidase Inhibitor (1)

Alpha Reductase Inhibitor (1)

Amphiglycemic? (1)

Analeptic (1)

Analgesic (13)

Anaphrodisiac (1)

Androgenic (2)

Androgenic? (1)

Anemiagenic (2)

Anesthetic (1)

Angiogenic (1)

Angiotensin Receptor Blocker (3)

Anorexic (3)

Anthelmintic (2)

AntiAGE (2)

AntiBPH (1)

AntiCFS (3)

AntiCTS (1)

AntiCrohn's (4)

AntiEBV (1)

AntiGTF (2)

AntiHIV (10)

AntiLegionella (3)

AntiLyme (5)

AntiMRSA (1)

AntiMS (3)

AntiMeniere's (1)

AntiNF kB (1)

AntiPMS (5)

Compounds Possessing Activity

CYSTINE

QUERCETIN

ALPHA TERPINEOL, ASCORBIC ACID, CAFFEIC ACID, CHLOROGENIC ACID, ELLAGIC ACID, KAEMPFEROL, P COUMARIC ACID, QUERCETIN, QUERCITRIN, SALICYLIC ACID, VANILLIC ACID

ARBUTIN, CATECHIN, CATECHOL, CHLOROGENIC ACID, CYANIDIN, QUERCETIN

ALPHA TERPINEOL, P COUMARIC ACID, VANILLIC ACID

BETA CAROTENE, CAFFEIC ACID, CATECHOL, CHLOROGENIC ACID, CITRAL, CITRIC ACID, LINALOOL, METHYL SALICYLATE, MUFA, NIACIN, OLEIC ACID, PROTOCATECHUIC ACID, QUERCETIN

CITRIC ACID

PROTOCATECHUIC ACID

OLEIC ACID

CHROMIUM

GAMMA AMINOBUTYRIC ACID

ASCORBIC ACID, CAFFEIC ACID, CHLOROGENIC ACID, GALLIC ACID, GENTISIC ACID, LINALOOL, METHYL SALICYLATE, QUERCETIN, SALICYLIC ACID, SELENIUM, THIAMIN, TRYPTOPHAN, ZINC

METHYL SALICYLATE

BETA SITOSTEROL, BORON

BETA CAROTENE

MUFA, OLEIC ACID

LINALOOL

BETA SITOSTEROL

ASCORBIC ACID, FIBER, POTASSIUM

ARSENIC, BETA SITOSTEROL, SELENIUM

TANNIN, VANILLIC ACID

ASCORBIC ACID, CHROMIUM

ZINC

ASCORBIC ACID, CHROMIUM, MAGNESIUM

ASCORBIC ACID

CHLOROGENIC ACID

ELLAGIC ACID, QUERCETIN

AGRIMONIIN, CAFFEIC ACID, CHLOROGENIC ACID, ELLAGIC ACID, ELLAGITANNIN, GALLIC ACID, QUERCETIN, SELENIUM, TANNIN, ZINC

CAFFEIC ACID, CHLOROGENIC ACID, PROTOCATECHUIC ACID

ASCORBIC ACID, MAGNESIUM, NIACIN, RIBOFLAVIN, THIAMIN

GALLIC ACID

LINOLEIC ACID, MAGNESIUM, PUFA

SELENIUM

BETA CAROTENE, CALCIUM, MAGNESIUM, MANGANESE, QUERCETIN

Biological Activity

AntiRaynaud's (3)
AntiSpina Bifida (1)
AntiTourette's (1)
Antiacetylcholinesterase (1)
Antiacid (1)
Antiacne (8)
Antiacrodermatitic (1)
Antiacrodynic (1)
Antiadenomic (1)
Antiadenoviral (1)
Antiadenovirus (1)
Antiadrenalinic (1)
Antiaflatoxin (4)
Antiaaggregant (10)
Antianging (5)
Antiakathisic (1)
Antialcoholic (6)
Antialdosteronic (1)
Antialkali? (1)
Antialkalotic (1)
Antiallergenic (2)
Antiallergic (9)
Antialopepic (5)
Antialzheimeran (7)
Antiamblyopic (1)
Antianaphylactic (6)
Antiangrogenic (4)
Antianemic (4)
Antianginal (3)
Antiangiogenic (5)
Antianorectic (2)
Antianorexic (1)
Antianxiety (3)
Antiapthic (1)
Antiarabiflavinotic (1)
Antiarrhythmic (5)
Antiartherosclerotic (3)
Antiarthritic (15)

Compounds Possessing Activity

FOLACIN

LINALOOL
GLYCINE
ALPHA TERPINEOL, BETA CAROTENE, CHROMIUM, LINOLEIC ACID, PUFA, SELENIUM, SULFUR, ZINC
ZINC
NIACIN
BETA SITOSTEROL
CAFFEIC ACID
GALLIC ACID
NICKEL
ELLAGIC ACID, IMPERATORIN, KAEMPFEROL, QUERCETIN
ALPHA LINOLENIC ACID, ASCORBIC ACID, CAFFEIC ACID, CATECHIN, IMPERATORIN, KAEMPFEROL, MAGNESIUM, QUERCETIN, SALICYLATES, SELENIUM
ASCORBIC ACID, BETA CAROTENE, CAFFEIC ACID, CHROMIUM, QUERCETIN
IRON
CATECHIN, GLUTAMINE, MAGNESIUM, MANGANESE, THIAMIN, ZINC
GLYCINE
GLUTAMIC ACID
LYSINE
CITRAL, GALLIC ACID
ASCORBIC ACID, CALCIUM, CITRAL, ELLAGITANNIN, KAEMPFEROL, LINALOOL, NIACIN, PANTOTHENIC ACID, QUERCETIN
IMPERATORIN, LINOLEIC ACID, OLEIC ACID, PALMITIC ACID, ZINC
ALPHA TOCOPHEROL, ASCORBIC ACID, LECITHIN, NIACIN, QUERCETIN, THIAMIN, ZINC
NIACIN
CITRAL, ELLAGIC ACID, GALLIC ACID, LINALOOL, LINOLEIC ACID, QUERCETIN
BETA SITOSTEROL, LINOLEIC ACID, OLEIC ACID, PALMITIC ACID
COPPER, FOLACIN, IRON, MANGANESE
ALPHA TOCOPHEROL, MAGNESIUM, NIACIN
ELLAGIC ACID, GALLIC ACID, QUERCETIN, SELENIUM, ZINC
MAGNESIUM, THIAMIN
ZINC
CALCIUM, MAGNESIUM, TRYPTOPHAN
CITRIC ACID
RIBOFLAVIN
CALCIUM, MAGNESIUM, POTASSIUM, PROTOCATECHUIC ACID, QUERCITRIN
HISTIDINE, LINOLEIC ACID, SILICON
ALPHA TOCOPHEROL, ASCORBIC ACID, BETA CAROTENE, CALCIUM, CATECHIN, COPPER, LINOLEIC ACID, MAGNESIUM, MANGANESE, PANTOTHENIC ACID,

Biological Activity

	Compounds Possessing Activity
Antiasthmatic (8)	QUERCETIN, SALICYLIC ACID, SELENIUM, SULFUR, ZINC
Antiataxic (1)	ALPHA TOCOPHEROL, ASCORBIC ACID, BETA CAROTENE, GALLIC ACID, MAGNESIUM, PROTOCATECHUIC ACID, QUERCETIN, SELENIUM
Antiatherogenic (1)	LECITHIN
Antiatheromic (1)	CAFFEIC ACID
Antiatherosclerotic (11)	PECTIN
Antibackache (1)	ALPHA TOCOPHEROL, ASCORBIC ACID, CALCIUM, CHLOROGENIC ACID, CHROMIUM, CITRIC ACID, LUTEIN, MAGNESIUM, MALIC ACID, QUERCETIN, SELENIUM
Antibacterial (25)	THIAMIN
Antiberiberi (1)	ALPHA TERPINEOL, ARBUTIN, ASCORBIC ACID, BETA SITOSTEROL, CAFFEIC ACID, CATECHIN, CHLOROGENIC ACID, CITRAL, CITRIC ACID, ELLAGIC ACID, GALLIC ACID, GENTISIC ACID, IODINE, KAEMPFEROL, LINALOOL, MALIC ACID, P COUMARIC ACID, P HYDROXY BENZOIC ACID, PECTIN, PROTOCATECHUIC ACID, QUERCETIN, QUERCITRIN, SALICYLIC ACID, TANNIN, VANILLIC ACID
Antibronchitic (1)	THIAMIN
Anticalculic (1)	GALLIC ACID
Anticancer (9)	CITRIC ACID
Anticancer (Breast) (3)	ALPHA TERPINEOL, ALPHA TOCOPHEROL, BETA CAROTENE, CAFFEIC ACID, CITRAL, GALLIC ACID, KAEMPFEROL, TANNIN, VANILLIC ACID
Anticancer (Cervix) (2)	BETA SITOSTEROL, CATECHOL, LUTEIN
Anticancer (Colon) (2)	BETA SITOSTEROL, ELLAGIC ACID
Anticancer (Esophagus) (1)	CHLOROGENIC ACID, ELLAGIC ACID
Anticancer (Esophagus)? (1)	ELLAGIC ACID
Anticancer (Forestomach) (1)	MOLYBDENUM
Anticancer (Liver) (1)	CHLOROGENIC ACID
Anticancer (Lung) (1)	CHLOROGENIC ACID
Anticancer (Mouth) (1)	BETA SITOSTEROL
Anticancer (Skin) (1)	ELLAGIC ACID
Anticanker (3)	CHLOROGENIC ACID
Anticarcinogenic (2)	IRON, THIAMIN, ZINC
Anticarcinomic (2)	CAFFEIC ACID, CHLOROGENIC ACID
Anticarcinomic (Breast) (1)	BETA CAROTENE, GALLIC ACID
Anticardiospasmic (1)	QUERCETIN
Anticariogenic (6)	THIAMIN
Anticarpal Tunnel (1)	ALPHA TERPINEOL, CATECHIN, ELLAGIC ACID, LINALOOL, QUERCETIN, TANNIN
Anticataract (11)	RIBOFLAVIN
Anticephalagic (4)	ALPHA TOCOPHEROL, ASCORBIC ACID, ELLAGIC ACID, METHIONINE, NIACIN, QUERCETIN, QUERCITRIN, RIBOFLAVIN, SELENIUM, THIAMIN, ZINC
Anticerebrotic (1)	GAMMA AMINOBUTYRIC ACID, MAGNESIUM, PANTOTHENIC ACID, RIBOFLAVIN
Anticervicaldysplasic (4)	GAMMA AMINOBUTYRIC ACID
Anticheilitic (3)	ASCORBIC ACID, BETA CAROTENE, FOLACIN, RIBOFLAVIN
Antichilblain (2)	FOLACIN, IRON, RIBOFLAVIN
	NIACIN, NICOTINIC ACID

Biological Activity

Antichoreic (1)
Anticirrhotic (2)
Anticirrhotic? (1)
Anticlastogen (2)
Anticlaudificant? (1)
Anticlimacteric (4)
Anticoagulant (1)
Anticoeliac (1)
Anticold (2)
Anticolic (1)
Anticolitic (3)
Anticomplementary (1)

Anticonvulsant (6)

Anticorneotic (1)
Anticoronary (5)
Anticystitic (1)
Antidandruff (4)
Antidecubitic (3)
Antideliriant (1)

Antidementia (7)

Antidepressant (10)

Antidermatitic (3)
Antidermatotic (1)

Antidiabetic (12)

Antidiabetic? (1)
Antidiarrheic (2)
Antidiscotic (1)
Antidote (Acetaminophen) (1)
Antidote (Aluminum) (2)
Antidote (Cadmium) (2)
Antidote (Hypoglycin A) (1)
Antidote (Lead) (3)
Antidote (Mercury) (1)
Antidote (Paracetamol) (1)
Antidote (Paraquat) (1)
Antidote (pesticides) (1)
Antidysenteric (1)
Antidysgeuzic (1)

Compounds Possessing Activity

GAMMA AMINOBUTYRIC ACID
LECITHIN, SELENIUM
NICKEL
P COUMARIC ACID, PROTOCATECHUIC ACID
PANTOTHENIC ACID
ASCORBIC ACID, CALCIUM, MAGNESIUM, SELENIUM
CITRIC ACID
ZINC
ASCORBIC ACID, ZINC
LINALOOL
QUERCETIN, THIAMIN, ZINC
QUERCETIN
ALPHA TOCOPHEROL, GAMMA AMINOBUTYRIC ACID, IMPERATORIN, LINALOOL, MAGNESIUM, NIACIN
CHROMIUM
BETA CAROTENE, LINOLEIC ACID, MAGNESIUM, SELENIUM, ZINC
QUERCETIN
SALICYLIC ACID, SELENIUM, SULFUR, ZINC
ASCORBIC ACID, RIBOFLAVIN, THIAMIN
THIAMIN
ALPHA TOCOPHEROL, ASCORBIC ACID, LECITHIN, NIACIN, THIAMIN, TRYPTOPHAN, ZINC
ASCORBIC ACID, CAFFEIC ACID, CALCIUM, FOLACIN, GLUTAMINE, MAGNESIUM, POTASSIUM, QUERCETIN, SELENIUM, TRYPTOPHAN
NIACIN, PANTOTHENIC ACID, QUERCETIN
SALICYLIC ACID
ALPHA TOCOPHEROL, ASCORBIC ACID, CHLOROGENIC ACID, CHROMIUM, COPPER, FIBER, MAGNESIUM, MANGANESE, NIACIN, PECTIN, QUERCETIN, ZINC
ARGININE
PECTIN, TANNIN
MANGANESE
METHIONINE
ASCORBIC ACID, CALCIUM
ASCORBIC ACID, ZINC
GLYCINE
ASCORBIC ACID, CALCIUM, CHROMIUM
SELENIUM
METHIONINE
ASCORBIC ACID
NICOTINIC ACID
TANNIN
ZINC

Biological Activity

Antidyskinetic (3)
Antidysmenorrhic (1)
Antidyspeptic (1)
Antidysphagic (1)
Antieczemic (7)
Antiedemic (7)
Antielastase (2)
Antiencephalitic (2)
Antiencephalopathic (6)
Antiencephalopathic? (1)
Antiendometriotic (2)
Antiendotoxic (1)
Antienteritic (1)
Antienterotic (1)
Antiepileptic (5)
Antiescherichic (3)
Antiestrogenic (2)
Antifatigue (8)
Antifeedant (6)
Antifertility (3)
Antifibrinolytic (3)
Antifibromyalgic (2)
Antifibrosarcomic (1)
Antifibrotic (3)
Antiflu (5)
Antifuruncular (1)
Antigallstone (2)
Antigastric (1)
Antigastritic (4)
Antigastrotic (1)
Antigenotoxic (1)
Antigingivitic (4)
Antiglaucomic (2)
Antiglossitic (2)
Antiglutamaergic (1)
Antiglycosuric (1)
Antigoiter (1)
Antigonadotrophic (1)
Antigonadotropic (4)

Compounds Possessing Activity

LECITHIN, MANGANESE, TRYPTOPHAN
MAGNESIUM
THIAMIN
NIACIN
ASCORBIC ACID, LECITHIN, LINOLEIC ACID, METHIONINE, PUFA, SALICYLIC ACID, ZINC
ARBUTIN, ASCORBIC ACID, BETA SITOSTEROL, CAFFEIC ACID, CATECHIN, LINALOOL, QUERCITRIN
CAFFEIC ACID, QUERCETIN
ASCORBIC ACID, QUERCETIN
ARGININE, GLYCINE, LEUCINE, THIAMIN, VALINE, ZINC
ISOLEUCINE
ASCORBIC ACID, MAGNESIUM
CATECHIN
PECTIN
MAGNESIUM
GLUTAMIC ACID, MAGNESIUM, MANGANESE, NIACIN, ZINC
CAFFEIC ACID, GALLIC ACID, QUERCETIN
BETA SITOSTEROL, QUERCETIN
ASCORBIC ACID, CHROMIUM, COPPER, MAGNESIUM, PANTOTHENIC ACID, POTASSIUM, THIAMIN, VANILLIC ACID
BETA SITOSTEROL, CATECHIN, CHLOROGENIC ACID, GENTISIC ACID, QUERCETIN, QUERCITRIN
BETA SITOSTEROL, KAEMPFEROL, P COUMARIC ACID
GALLIC ACID, LINOLEIC ACID, PALMITIC ACID
MAGNESIUM, MALIC ACID
QUERCETIN
ASCORBIC ACID, SELENIUM, ZINC
CAFFEIC ACID, CATECHIN, GALLIC ACID, QUERCETIN, QUERCITRIN
ZINC
ASCORBIC ACID, PECTIN
QUERCETIN
ASCORBIC ACID, GLYCINE, PECTIN, THIAMIN
MAGNESIUM
CHLOROGENIC ACID
ASCORBIC ACID, ELLAGIC ACID, FOLACIN, KAEMPFEROL
ASCORBIC ACID, MAGNESIUM
FOLACIN, RIBOFLAVIN
LINALOOL
CHROMIUM
IODINE
BETA SITOSTEROL
CAFFEIC ACID, CATECHOL, CHLOROGENIC ACID, QUERCETIN

Biological Activity

Antigout (1)
Antigranular (1)
Antigrey (1)
Antihangover (4)
Antiheartburn (1)
Antihelicobacter (1)
Antihemolytic (2)
Antihemorrhagic (3)
Antihepatitic (3)
Antihepatoadenomic (1)
Antihepatotic (1)

Antihepatotoxic (12)

Antitherpetic (12)
Antitherpetic? (1)

Antihistaminic (10)

Antihomocystinuric (1)
Antihydrophobic (1)
Antihyperactivity (1)
Antihyperammonemic (1)
Antihypercholesterolemic (3)
Antihyperkeratotic (1)
Antihyperkinetic (2)
Antihyperlipidemic (1)
Antihyperlipoproteinaemic (1)

Antihypertensive (11)
Antihyperthyroid (3)
Antihypoglycemic (1)
Antiichthyosic (1)
Antiichthyotic (1)
Antiileus? (1)
Antiimplantation (1)
Antiimpotence (2)
Antiinfarctal (1)
Antiinfective (1)
Antiinfertility (4)

Antiinflammatory (28)

Compounds Possessing Activity

SELENIUM
LINOLEIC ACID
SULFUR
ASCORBIC ACID, NIACIN, THIAMIN, ZINC
THIAMIN
CITRAL
CAFFEIC ACID, CHLOROGENIC ACID
ASCORBIC ACID, PHYLLOQUINONE, QUERCITRIN
ARGININE, ASCORBIC ACID, CATECHIN
CAFFEIC ACID
METHIONINE
ASCORBIC ACID, CAFFEIC ACID, CATECHIN, CHLOROGENIC ACID, GALLIC ACID, P
COUMARIC ACID, PEDUNCULAGIN, PROTOCATECHUIC ACID, QUERCETIN,
QUERCITRIN, STIGMASTEROL, TANNIN
ASCORBIC ACID, CAFFEIC ACID, CATECHIN, CHLOROGENIC ACID, CITRAL, GALLIC ACID,
KAEMPFEROL, LYSINE, PROTOCATECHUIC ACID, QUERCETIN, QUERCITRIN, THIAMIN
ZINC
ASCORBIC ACID, CAFFEIC ACID, CATECHIN, CHLOROGENIC ACID, CITRAL,
KAEMPFEROL, LINALOOL, LINOLEIC ACID, NIACIN, QUERCETIN
CYSTINE
QUERCETIN
NIACIN
GLUTAMIC ACID
CAFFEIC ACID, CHLOROGENIC ACID, PANTOTHENIC ACID
BETA CAROTENE
CALCIUM, MAGNESIUM
CATECHIN
BETA SITOSTEROL
ALPHA LINOLENIC ACID, ARGININE, ASCORBIC ACID, CALCIUM, FIBER, GAMMA
AMINOBUTYRIC ACID, MAGNESIUM, POTASSIUM, QUERCETIN, TANNIN, TRYPTOPHAN
CAFFEIC ACID, CHLOROGENIC ACID, ELLAGIC ACID
MAGNESIUM
SALICYLIC ACID
BETA CAROTENE
PANTOTHENIC ACID
KAEMPFEROL
ARGININE, ZINC
ALPHA TOCOPHEROL
ZINC
ALPHA TOCOPHEROL, ARGININE, ASCORBIC ACID, ZINC
ALPHA LINOLENIC ACID, ALPHA TERPINEOL, ASCORBIC ACID, BETA SITOSTEROL,
CAFFEIC ACID, CATECHIN, CHLOROGENIC ACID, CITRAL, COPPER, ELLAGIC ACID,
GALLIC ACID, GENTISIC ACID, IMPERATORIN, KAEMPFEROL, LINALOOL, LINOLEIC ACID,

Biological Activity

Antiinsomniac (4)
Antiinsomniac? (1)
Antiinsomnic (2)
Antiischemic (2)
Antikeratitic (1)
Antikeshan (1)
Antileishmanic (4)
Antileptic (2)
Antilethargic (1)
Antileukemic (10)
Antileukodermic (1)
Antileukonychic (1)
Antileukoplakic (1)
Antileukotriene (4)
Antileukotriene D4 (4)
Antilipolytic (2)
Antilipoperoxidant (3)
Antilithic (5)
Antilupus (1)
Antilymphocytic (1)
Antilymphomic (3)
Antimaculitic (6)
Antimalarial (2)
Antimange (1)
Antimanic (2)
Antimastalgic (1)
Antimastitic (1)
Antimeasles (1)
Antimelanogenic (4)
Antimelanomic (2)
Antimenopausal (5)
Antimenorrhagic (3)
Antimetastatic (5)
Antimigraine (5)
Antimite (1)
Antimitotic (1)
Antimitral valve prolapse (1)
Antimorphinic (1)

Compounds Possessing Activity

MAGNESIUM, METHYL SALICYLATE, MUFA, NEO CHLOROGENIC ACID, OLEIC ACID, PROTOCATECHUIC ACID, QUERCETIN, QUERCITRIN, SALICYLATES, SALICYLIC ACID, STIGMASTEROL, VANILLIC ACID
CALCIUM, MAGNESIUM, TRYPTOPHAN, ZINC
PANTOTHENIC ACID
GAMMA AMINOBUTYRIC ACID, NIACIN
ALPHA TOCOPHEROL, PROTOCATECHUIC ACID
RIBOFLAVIN
SELENIUM
CITRAL, CITRIC ACID, GALLIC ACID, QUERCETIN
ASCORBIC ACID, ZINC
GAMMA AMINOBUTYRIC ACID
BETA SITOSTEROL, CAFFEIC ACID, CATECHIN, KAEMPFEROL, LINALOOL, P COUMARIC ACID, PROTOCATECHUIC ACID, QUERCETIN, SELENIUM, VANILLIC ACID
IMPERATORIN
ZINC
BETA CAROTENE
CAFFEIC ACID, CHLOROGENIC ACID, QUERCETIN, SELENIUM
ALPHA LINOLENIC ACID, LINOLEIC ACID, MUFA, OLEIC ACID
PEDUNCULAGIN, TANNIN
BETA CAROTENE, CATECHIN, QUERCETIN
ASCORBIC ACID, GLUTAMIC ACID, LECITHIN, MAGNESIUM, PECTIN
BETA CAROTENE
KAEMPFEROL
BETA SITOSTEROL, LINALOOL, ZINC
ALPHA TOCOPHEROL, ASCORBIC ACID, BETA CAROTENE, LUTEIN, SELENIUM, ZINC
ELLAGIC ACID, QUERCETIN
LINALOOL
LECITHIN, TRYPTOPHAN
MAGNESIUM
BETA CAROTENE
ASCORBIC ACID
ARBUTIN, CAFFEIC ACID, CHLOROGENIC ACID, PROTOCATECHUIC ACID
QUERCETIN, SELENIUM
ASCORBIC ACID, CALCIUM, MAGNESIUM, SELENIUM, TRYPTOPHAN
ALPHA LINOLENIC ACID, IRON, LINOLEIC ACID
ALPHA LINOLENIC ACID, PECTIN, QUERCETIN, SELENIUM, ZINC
ASCORBIC ACID, MAGNESIUM, RIBOFLAVIN, THIAMIN, TRYPTOPHAN
LINALOOL
IMPERATORIN
MAGNESIUM
ASPARTIC ACID

Biological Activity

Antimorphinistic (1)

Antimutagenic (19)

Antimyalgic (1)

Antimyelotoxic (1)

Antimyocarditic (2)

Antinephritic (2)

Antinephrolytic (1)

Antineuralgic (3)

Antineuramidase (1)

Antineurasthenic (1)

Antineuritic (1)

Antineuropathic (4)

Antineurotic (1)

Antinitrosaminic (5)

Antinitrosic (1)

Antinociceptive (3)

Antinyctalopic (2)

Antiobesity (6)

Antioncychomycotic (1)

Antionychyotic (1)

Antiophidic (5)

Antiorchitic (1)

Antiosteoarthritic (4)

Antiosteoporotic (9)

Antiosteotic (1)

Antiototic (1)

Antioxidant (37)

Antioxidant Synergist (3)

Antioxidant? (2)

Antiozenic (1)

Antipancreatic (1)

Antipapillomic (1)

Antiparkinsonian (6)

Compounds Possessing Activity

LECITHIN

ALPHA TOCOPHEROL, ASCORBIC ACID, BETA CAROTENE, BETA SITOSTEROL, CAFFEIC ACID, CHLOROGENIC ACID, CITRIC ACID, ELLAGIC ACID, GALLIC ACID, IMPERATORIN, KAEMPFEROL, LINALOOL, P HYDROXY BENZOIC ACID, PECTIN, PEDUNCULAGIN, PROTOCATECHUIC ACID, QUERCETIN, QUERCITRIN, TANNIN

SELENIUM

FOLACIN

QUERCETIN, THIAMIN

HISTIDINE, TANNIN

MAGNESIUM

NIACIN, SALICYLIC ACID, THIAMIN

ASCORBIC ACID

THIAMIN

THIAMIN

ALPHA TOCOPHEROL, FOLACIN, THIAMIN, ZINC

MAGNESIUM

CAFFEIC ACID, CHLOROGENIC ACID, GALLIC ACID, P COUMARIC ACID, QUERCETIN

ASCORBIC ACID

COPPER, QUERCETIN, STIGMASTEROL

LUTEIN, ZINC

ASCORBIC ACID, CALCIUM, CHROMIUM, FIBER, PECTIN, ZINC

SALICYLIC ACID

SILICON

BETA SITOSTEROL, CAFFEIC ACID, PROTOCATECHUIC ACID, STIGMASTEROL, TANNIN

ASCORBIC ACID

ASCORBIC ACID, BORON, SELENIUM, SULFUR

ASCORBIC ACID, BORON, CALCIUM, COPPER, MAGNESIUM, MANGANESE, PHOSPHORUS, SILICON, ZINC

CATECHIN

MANGANESE

ALANINE, ALPHA TOCOPHEROL, ASCORBIC ACID, BETA CAROTENE, BETA SITOSTEROL, CAFFEIC ACID, CAMPESTEROL, CATECHIN, CATECHOL, CHLOROGENIC ACID, CITRAL, CYANIDIN, ELLAGIC ACID, ELLAGITANNIN, GALLIC ACID, GENTISIC ACID, HISTIDINE, KAEMPFEROL, LEUCOANTHOCYANIN, LUTEIN, MANGANESE, METHIONINE, METHYL SALICYLATE, P COUMARIC ACID, P HYDROXY BENZOIC ACID, PALMITIC ACID, PEDUNCULAGIN, PROTOCATECHUIC ACID, QUERCETIN, QUERCITRIN, RIBOFLAVIN, SALICYLIC ACID, SELENIUM, STIGMASTEROL, TANNIN, TRYPTOPHAN, VANILLIC ACID

CITRIC ACID, LECITHIN, MALIC ACID

ARGININE, THREONINE

BETA CAROTENE

QUERCETIN

BETA CAROTENE

ALPHA TOCOPHEROL, ASCORBIC ACID, METHIONINE, NIACIN, SELENIUM,

Biological Activity

Antiparotitic (1)
Antipellagic (3)
Antiperiodic (1)
Antiperiodontal (2)
Antiperiodontic (2)
Antiperiodontitic (5)
Antiperistaltic (1)
Antipermeability (1)

Antiperoxidant (10)

Antipharyngitic (1)
Antiphenylketonuric (1)
Antiphotophobic (2)
Antipityriasic (1)
Antiplatelet (1)
Antiplasmodial (2)
Antiplasmodial (2)
Antipneumonic (1)
Antipodagric (1)
Antipodriac (2)
Antipolio (3)
Antipoliomyelitic (2)
Antipolyneuritic (1)
Antiporphyrin (1)
Antiprogestational (1)
Antiprolactin (1)
Antiproliferant (6)
Antiprostaglandin (4)
Antiprostanoid (1)
Antiprostataadenomic (1)

Antiprostatitic (7)
Antiprostatotic (1)
Antiproteolytic (1)
Antipruritic (1)
Antipsoriatic (4)
Antipsychotic (2)
Antipurpuric (1)
Antipyretic (5)

Compounds Possessing Activity

TRYPTOPHAN
ASCORBIC ACID
ISOLEUCINE, NIACIN, RIBOFLAVIN
SALICYLIC ACID
CATECHIN, QUERCETIN
ELLAGIC ACID, KAEMPFEROL
ASCORBIC ACID, CALCIUM, FOLACIN, GALLIC ACID, ZINC
QUERCETIN
QUERCETIN
AGRIMONIIN, CAFFEIC ACID, CHLOROGENIC ACID, ELLAGIC ACID, GALLIC ACID, P
COUMARIC ACID, PEDUNCULAGIN, PROTOCATECHUIC ACID, QUERCETIN, VANILLIC
ACID
QUERCETIN
TRYPTOPHAN
BETA CAROTENE, RIBOFLAVIN
BETA CAROTENE
CATECHIN, ELLAGIC ACID, FOLACIN, KAEMPFEROL, MAGNESIUM, QUERCETIN, ZINC
ELLAGIC ACID, QUERCETIN
IMPERATORIN
ASCORBIC ACID
SALICYLIC ACID
ASCORBIC ACID, QUERCETIN
CHLOROGENIC ACID, GALLIC ACID, QUERCETIN
ASCORBIC ACID, THIAMIN
PUFA
BETA CAROTENE
BETA SITOSTEROL
ZINC
ALPHA TERPINEOL, BETA CAROTENE, CAFFEIC ACID, LUTEIN, QUERCETIN, SELENIUM
BETA SITOSTEROL, CAFFEIC ACID, CATECHIN, TRYPTOPHAN
QUERCETIN
BETA SITOSTEROL
ALPHA LINOLENIC ACID, BETA SITOSTEROL, GLUTAMIC ACID, GLYCINE, LINOLEIC ACID,
QUERCETIN, ZINC
PHYTOSTEROLS
GALLIC ACID
GLYCINE
BETA CAROTENE, LECITHIN, QUERCETIN, SALICYLIC ACID
FOLACIN, TRYPTOPHAN
QUERCITRIN
ASCORBIC ACID, BETA SITOSTEROL, METHYL SALICYLATE, SALICYLATES, SALICYLIC
ACID

Biological Activity

Antiradicular (16)
Antirenitic (1)
Antiretardation (1)
Antiretinitic Optometry (1)
Antiretinopathic (1)
Antiretinotic (2)
Antirheumatalgic (1)
Antirheumatic (9)
Antirheumatitic? (1)
Antirhinitic (1)
Antisarcotic (1)
Antischizophrenic (1)
Antisclerodermic (2)
Antiscoliotic (1)
Antiscorbutic (1)
Antiscotomic (1)
Antiseborrheic (5)

Antiseptic (22)

Antiserotonin (1)
Antishingles (1)
Antishock (2)
Antisickling (5)
Antisilicotic (1)
Antispare Tire (1)

Antispasmodic (12)

Antispasmophilic (1)
Antisprue (1)
Antistaphylococcic (4)
Antistomatitic (3)
Antistreptococcic (3)

Antistress (5)

Antistroke (3)
Antisunburn (2)

Compounds Possessing Activity

ALPHA TOCOPHEROL, ASCORBIC ACID, BETA CAROTENE, CAFFEIC ACID, CATECHIN, CHLOROGENIC ACID, GALLIC ACID, KAEMPFEROL, LUTEIN, METHYL SALICYLATE, P HYDROXY BENZOIC ACID, PROTOCATECHUIC ACID, QUERCETIN, SELENIUM, TANNIN, VANILLIC ACID
TANNIN
GLUTAMIC ACID
LUTEIN
MAGNESIUM
ALPHA TOCOPHEROL, ASCORBIC ACID
METHYL SALICYLATE
ALPHA TOCOPHEROL, ASCORBIC ACID, BETA CAROTENE, CALCIUM, GENTISIC ACID, SALICYLIC ACID, SELENIUM, TRYPTOPHAN, ZINC
PANTOTHENIC ACID
ASCORBIC ACID
AGRIMONIIN
NICOTINIC ACID
CATECHIN, LECITHIN
TRYPTOPHAN
ASCORBIC ACID
NIACIN
CITRIC ACID, LECITHIN, MALIC ACID, SALICYLIC ACID, SULFUR
ALPHA TERPINEOL, ARBUTIN, ASCORBIC ACID, CAFFEIC ACID, CATECHOL, CHLOROGENIC ACID, CITRAL, CITRIC ACID, ELLAGIC ACID, FURFURAL, GALLIC ACID, IODINE, KAEMPFEROL, LINALOOL, MALIC ACID, METHYL SALICYLATE, P COUMARIC ACID, PROTOCATECHUIC ACID, SALICYLIC ACID, SULFUR, VANILLIC ACID, ZINC
KAEMPFEROL
ASCORBIC ACID
CITRAL, LINALOOL
ASPARAGINE, GLUTAMINE, GLYCINE, P HYDROXY BENZOIC ACID, VANILLIC ACID
ALUMINUM
ZINC
ASCORBIC ACID, CAFFEIC ACID, CITRAL, KAEMPFEROL, LINALOOL, MAGNESIUM, NIACIN, P COUMARIC ACID, POTASSIUM, PROTOCATECHUIC ACID, QUERCETIN, QUERCITRIN
MAGNESIUM
LECITHIN
CAFFEIC ACID, GALLIC ACID, KAEMPFEROL, QUERCITRIN
CAFFEIC ACID, CATECHOL, ZINC
ARBUTIN, ELLAGIC ACID, QUERCETIN
ASCORBIC ACID, BETA CAROTENE, CALCIUM, GAMMA AMINOBUTYRIC ACID, MAGNESIUM
ALPHA TOCOPHEROL, MAGNESIUM, POTASSIUM
CAFFEIC ACID, CHLOROGENIC ACID

Biological Activity

Antisyndrome X (6)
Antitartar (1)
Antithiamin (3)
Antithrombic (1)
Antithrombogenic (1)
Antithyreotropic (1)
Antithyroid (3)
Antithyrotoxic (2)
Antititic (1)
Antitinnitic (2)
Antitriglyceride (2)
Antitrypanosomic (1)
Antitubercular (2)

Antitumor (21)

Antitumor (Bladder) (2)
Antitumor (Breast) (6)
Antitumor (CNS) (1)
Antitumor (Cervix) (1)
Antitumor (Colon) (7)
Antitumor (Esophagus)? (1)
Antitumor (Forestomach) (1)
Antitumor (Gastric) (1)
Antitumor (Liver) (2)
Antitumor (Lung) (6)
Antitumor (Mouth) (1)
Antitumor (Ovary) (1)
Antitumor (Prostate) (4)
Antitumor (Skin) (5)
Antitumor (Stomach) (2)
Antitumor (brain) (1)
Antitumor Promoter (9)
Antitussive (3)
Antitympanitic (1)

Antiulcer (16)
Antiulcerogenic (2)

Compounds Possessing Activity

ASCORBIC ACID, CHROMIUM, MAGNESIUM, MANGANESE, SELENIUM, ZINC
METHYL SALICYLATE
CAFFEIC ACID, CATECHOL, QUERCETIN
QUERCETIN
QUERCITRIN
CATECHOL
CAFFEIC ACID, CHLOROGENIC ACID, ELLAGIC ACID
IODINE, NICOTINIC ACID
CALCIUM
GAMMA AMINOBUTYRIC ACID, ZINC
CHROMIUM, ZINC
QUERCETIN
CITRIC ACID, MALIC ACID
AGRIMONIIN, ALPHA TOCOPHEROL, BETA CAROTENE, CAFFEIC ACID, CATECHOL, CHLOROGENIC ACID, CITRAL, CITRIC ACID, ELLAGIC ACID, ELLAGITANNIN, FIBER, GALLIC ACID, KAEMPFEROL, MALIC ACID, P COUMARIC ACID, QUERCETIN, QUERCITRIN, SALICYLIC ACID, SELENIUM, TANNIN, VANILLIC ACID
ALPHA TOCOPHEROL, QUERCETIN
BETA CAROTENE, BETA SITOSTEROL, CATECHOL, LUTEIN, QUERCETIN, SELENIUM
BETA CAROTENE
BETA SITOSTEROL
BETA CAROTENE, CHLOROGENIC ACID, CITRAL, LUTEIN, PECTIN, PROTOCATECHUIC ACID, QUERCETIN
MOLYBDENUM
CHLOROGENIC ACID
ASCORBIC ACID
CHLOROGENIC ACID, CITRAL
ASCORBIC ACID, BETA CAROTENE, BETA SITOSTEROL, LECITHIN, QUERCETIN, SELENIUM
PROTOCATECHUIC ACID
QUERCETIN
ALPHA TOCOPHEROL, BETA CAROTENE, PECTIN, SELENIUM
CAFFEIC ACID, CHLOROGENIC ACID, CITRAL, PROTOCATECHUIC ACID, QUERCETIN
ALPHA TOCOPHEROL, BETA CAROTENE
SELENIUM
ALPHA TOCOPHEROL, CAFFEIC ACID, CHLOROGENIC ACID, GALLIC ACID, IMPERATORIN, KAEMPFEROL, QUERCETIN, TANNIN, VANILLIC ACID
ARBUTIN, PECTIN, PROTOCATECHUIC ACID
SALICYLIC ACID
ASCORBIC ACID, BETA CAROTENE, CATECHIN, CHLOROGENIC ACID, CITRAL, FIBER, GLUTAMINE, GLYCINE, HISTIDINE, KAEMPFEROL, PECTIN, QUERCETIN, QUERCITRIN, TANNIN, THREONINE, ZINC
CAFFEIC ACID, SELENIUM

Biological Activity

Antiuremic (1)

Antiuricosuric (1)

Antivaccinia (1)

Antivaginitic (1)

Antivertigo (1)

Antiviral (19)

Antiviral? (1)

Antivittilic (1)

Antixerophthalmic (1)

Antiyeast (1)

Anxiolytic (8)

Aphrodisiac (1)

Apoptotic (9)

Aromatase Inhibitor (1)

Artemicide (3)

Ascaricide (1)

Asthma preventive (1)

Astringent (4)

Autotoxic (1)

Bacteristat (3)

Barbituate Synergist (2)

Beta Adrenergic Receptor Blocker
(2)

Beta Blocker (2)

Beta Glucuronidase Inhibitor (1)

Bradycardiac (1)

Bronchodilator (1)

Bronchorelaxant (2)

Bruchiphobe (1)

Bufocide (1)

CNS Active (2)

CNS Depressant (3)

CNS Inhibitor (1)

CNS Stimulant (1)

COMP Inhibitor (1)

COMT Inhibitor (1)

COX 1 Inhibitor (2)

COX 2 Inhibitor (5)

Compounds Possessing Activity

HISTIDINE

SALICYLATES

CAFFEIC ACID

ALUMINUM

NIACIN

ANTHOCYANIN, ASCORBIC ACID, BETA SITOSTEROL, CAFFEIC ACID, CATECHIN, CATECHOL, CHLOROGENIC ACID, CITRAL, ELLAGIC ACID, GALLIC ACID, GENTISIC ACID, IODINE, KAEMPFEROL, LINALOOL, PROTOCATECHUIC ACID, QUERCETIN, QUERCITRIN, STIGMASTEROL, TANNIN

ZINC

IMPERATORIN

BETA CAROTENE

ELLAGIC ACID

CAFFEIC ACID, CALCIUM, GAMMA AMINOBUTYRIC ACID, GLUTAMIC ACID, MAGNESIUM, PHOSPHORUS, POTASSIUM, SELENIUM

ARGININE

ASCORBIC ACID, BETA SITOSTEROL, CITRAL, ELLAGIC ACID, GALLIC ACID, KAEMPFEROL, PROTOCATECHUIC ACID, QUERCETIN, SELENIUM

KAEMPFEROL

ARBUTIN, BETA SITOSTEROL, STIGMASTEROL

VANILLIC ACID

ASCORBIC ACID

CATECHIN, ELLAGIC ACID, GALLIC ACID, ZINC

CHLOROGENIC ACID

GALLIC ACID, MALIC ACID, QUERCETIN

CITRAL, LINALOOL

ASCORBIC ACID, PEDUNCULAGIN

FIBER, POTASSIUM

ASCORBIC ACID

QUERCETIN

GALLIC ACID

CITRAL, LINALOOL

MALIC ACID

IMPERATORIN

CAFFEIC ACID, CHLOROGENIC ACID

LINALOOL, MAGNESIUM, QUERCITRIN

GAMMA AMINOBUTYRIC ACID

CHLOROGENIC ACID

CATECHIN

QUERCETIN

BETA CAROTENE, CATECHIN

BETA CAROTENE, CAFFEIC ACID, KAEMPFEROL, QUERCETIN, SALICYLIC ACID

Biological Activity

Calcium Antagonist (5)
Calcium Channel Blocker (1)
Calmodulin Antagonist (1)

Cancer Preventive (37)

Candida SAP Inhibitor (1)
Candidicide (5)
Candidistat (1)
Capillariprotective (1)
Carcinogenic (11)
Cardiomyopathogenic (1)
Cardioprotective (12)
Cardiotonic (1)
Cardiotoxic (2)
Cardiovascular (1)
Carminative (2)
Caspase 3 Inducer (1)
Caspase 8 Inducer (1)
Catabolic (2)
Chelator (1)
Chemopreventive (7)
Cholagogue (2)
Choleretic (10)
Cholinergic (1)
Cicatrizant (1)
Circulotonic (2)
Clastogenic (2)
Co carcinogenic (2)
Cold preventive (1)
Collagen Sparing (2)
Collagenic (2)
Colorant (2)
Comedogenic (1)

Compounds Possessing Activity

ASCORBIC ACID, CAFFEIC ACID, CITRAL, IMPERATORIN, MAGNESIUM
CALCIUM
QUERCETIN
ALANINE, ALPHA LINOLENIC ACID, ALPHA TOCOPHEROL, ASCORBIC ACID, BETA CAROTENE, BETA SITOSTEROL, CAFFEIC ACID, CATECHIN, CATECHOL, CHLOROGENIC ACID, CITRAL, ELLAGIC ACID, FIBER, GALLIC ACID, GLYCINE, IMPERATORIN, KAEMPFEROL, LINALOOL, LINOLEIC ACID, METHIONINE, METHYL SALICYLATE, MUFA, NIACIN, OLEIC ACID, P COUMARIC ACID, P HYDROXY BENZOIC ACID, PANTOTHENIC ACID, PECTIN, QUERCETIN, QUERCITRIN, RIBOFLAVIN, SALICYLIC ACID, SELENIUM, SERINE, STIGMASTEROL, TANNIN, VANILLIC ACID
ELLAGIC ACID
ALUMINUM, ARBUTIN, BETA SITOSTEROL, GALLIC ACID, QUERCETIN
LINALOOL
QUERCETIN
CAFFEIC ACID, CATECHIN, CATECHOL, CITRAL, GALLIC ACID, KAEMPFEROL, LINOLEIC ACID, PROTOCATECHUIC ACID, QUERCETIN, TANNIN, TRYPTOPHAN
COBALT
ALPHA TOCOPHEROL, ASCORBIC ACID, CHLOROGENIC ACID, CHROMIUM, COPPER, FIBER, MAGNESIUM, NIACIN, POTASSIUM, PROTOCATECHUIC ACID, SELENIUM, SILICON
QUERCITRIN
ELLAGITANNIN, POTASSIUM
GAMMA AMINOBUTYRIC ACID
LINALOOL, METHYL SALICYLATE
CITRAL
BETA SITOSTEROL
GLUTAMINE, QUERCETIN
TANNIN
BETA CAROTENE, CAFFEIC ACID, CHLOROGENIC ACID, CITRAL, P COUMARIC ACID, PECTIN, PROTOCATECHUIC ACID
CAFFEIC ACID, CHLOROGENIC ACID
CAFFEIC ACID, CHLOROGENIC ACID, GALLIC ACID, KAEMPFEROL, MUFA, NICOTINIC ACID, OLEIC ACID, P COUMARIC ACID, QUERCITRIN, VANILLIC ACID
LECITHIN
ALPHA TERPINEOL
ALPHA TOCOPHEROL, NIACIN
CAFFEIC ACID, CHLOROGENIC ACID
CAFFEIC ACID, CATECHOL
ASCORBIC ACID
CAFFEIC ACID, CHLOROGENIC ACID
ASCORBIC ACID, ZINC
BETA CAROTENE, LUTEIN
SULFUR

Biological Activity

Comedolytic (2)
Contraceptive (1)
Convulsant (1)
Copper Antagonist (1)
Copper Chelator (2)
Cosmetic (1)
Counterirritant (1)
Culicide (1)
Cyclooxygenase Activator (1)
Cyclooxygenase Inhibitor (6)
Cytochrome P450 1A2 Inhibitor (1)
Cytochrome P450 Inhibitor (1)
Cytoprotective (1)
Cytotoxic (8)
DME Inhibitor (1)
DNA Active (1)
DNA Protective (1)
Deiodinase Inhibitor (2)
Demulcent (1)
Dentifrice (1)
Deodorant (1)
Depressant (1)
Dermatitigenic (5)
Detoxicant (3)
Detoxicant (Alcohol) (1)
Diaphoretic? (3)
Differentiator (1)
Disinfectant (1)

Diuretic (13)

Dye (1)
Emetic (1)
Encephalopathic (1)
Energizer (1)
Ergogenic (1)
Erythrocytogenic (1)

Essential (8)
Estrogenic (6)

Compounds Possessing Activity

LINOLEIC ACID, SALICYLIC ACID
COPPER
CATECHOL
ZINC
KAEMPFEROL, QUERCETIN
STEARIC ACID
METHYL SALICYLATE
LINALOOL
QUERCITRIN
CATECHIN, GALLIC ACID, KAEMPFEROL, QUERCETIN, SALICYLIC ACID, TANNIN
QUERCETIN
IMPERATORIN
CAFFEIC ACID
CAFFEIC ACID, CITRAL, ELLAGIC ACID, GALLIC ACID, KAEMPFEROL, LINALOOL, P
COUMARIC ACID, QUERCETIN
IMPERATORIN
CAFFEIC ACID
CAFFEIC ACID
ELLAGIC ACID, QUERCETIN
PECTIN
METHYL SALICYLATE
ZINC
SELENIUM
CATECHOL, IODINE, MUFA, OLEIC ACID, SALICYLIC ACID
ASCORBIC ACID, ELLAGIC ACID, QUERCITRIN
ZINC
KAEMPFEROL, P COUMARIC ACID, QUERCETIN
QUERCETIN
CITRIC ACID
ARBUTIN, ARGININE, ASCORBIC ACID, ASPARAGINE, CAFFEIC ACID, CALCIUM,
CHLOROGENIC ACID, FIBER, GAMMA AMINOBUTYRIC ACID, KAEMPFEROL,
MAGNESIUM, POTASSIUM, QUERCITRIN
QUERCITRIN
METHIONINE
ALUMINUM
CHROMIUM
ZINC
COBALT
HISTIDINE, ISOLEUCINE, LEUCINE, LSINE, METHIONINE, THREONINE, TRYPTOPHAN,
VALINE
BETA SITOSTEROL, BORON, CITRAL, KAEMPFEROL, QUERCETIN, STIGMASTEROL

Biological Activity

Expectorant (2)
FLavor (12)
Febrifuge (1)
Fibrinolytic (1)
Fistula Preventive (1)
Floral Inhibitor (1)

Fungicide (17)

Fungistat (1)
GABA nergic (1)
Gastroprotective (1)
Glaucomagenic (1)
Glucosyl Transferase Inhibitor (3)
Glutathione Depleting (1)
Glutathionigenic (2)
Goitrogenic (1)
Gonadotrophic (1)
Gram(+)icide (1)
Gram()icide (1)
HIV RT Inhibitor (3)
Hematopoietic (1)
Hemolytic (1)
Hemopoietic (1)

Hemostat (7)

Hemostatic (1)
Hepatocarcinogenic (1)
Hepatomagenic (1)

Hepatoprotective (14)

Hepatotonic (1)
Hepatotoxic (3)
Hepatotropic (1)
Herbicide (2)
Herpetifuge (1)
Histamine Inhibitor (2)
Hypercholesterolemic (1)
Hyperglycemic (1)
Hypertensive (2)

Compounds Possessing Activity

CITRAL, LINALOOL
ALPHA TERPINEOL, CITRAL, CITRIC ACID, FURFURAL, LINALOOL, METHYL SALICYLATE, MUFA, OLEIC ACID, PALMITIC ACID, STEARIC ACID, THREONINE, VALINE
BETA SITOSTEROL
NIACIN
ASCORBIC ACID
GALLIC ACID
CAFFEIC ACID, CATECHIN, CHLOROGENIC ACID, CITRAL, FURFURAL, IODINE, KAEMPFEROL, LINALOOL, METHYL SALICYLATE, P COUMARIC ACID, PECTIN, PHYLLOQUINONE, PROTOCATECHUIC ACID, QUERCETIN, SALICYLIC ACID, SELENIUM, VANILLIC ACID
P HYDROXY BENZOIC ACID
LINALOOL
BETA CAROTENE
CITRAL
ELLAGIC ACID, QUERCETIN, TANNIN
PROTOCATECHUIC ACID
CITRAL, METHIONINE
IODINE
BETA SITOSTEROL
N/A
GALLIC ACID
ELLAGIC ACID, KAEMPFEROL, QUERCETIN
FOLACIN
PALMITIC ACID
MALIC ACID
ANTHOCYANIN, CATECHIN, CITRIC ACID, GALLIC ACID, PECTIN, QUERCETIN, QUERCITRIN
ELLAGIC ACID
CAFFEIC ACID
QUERCETIN
BETA SITOSTEROL, CAFFEIC ACID, CATECHIN, CHLOROGENIC ACID, ELLAGIC ACID, GALLIC ACID, IMPERATORIN, KAEMPFEROL, LECITHIN, LINOLEIC ACID, METHIONINE, NIACIN, QUERCETIN, TANNIN
QUERCITRIN
IMPERATORIN, NIACIN, PROTOCATECHUIC ACID
CAFFEIC ACID
CATECHOL, CITRAL
METHYL SALICYLATE
CAFFEIC ACID, CHLOROGENIC ACID
PALMITIC ACID
SALICYLATES
CADMIUM, SODIUM

Biological Activity

Hyperthyroid (1)
Hypnotic (2)
Hypoammonemic (1)
Hypoarginanemic (1)

Hypocholesterolemic (19)

Hypoglycemic (13)

Hypolipidemic (2)

Hypotensive (13)

Hypothermic (1)
Hypouricemic (1)
ICAM 1 Inhibitor (1)
Immunomodulator (9)

Immunostimulant (13)

Immunosuppressant (5)
Inotropic (2)
Insecticide (3)
Insectifuge (9)
Insectiphile (2)
Insulin Sparing (3)
Insulinase Inhibitor (2)
Insulinogenic (4)
Insulinotonic (2)
Interferon Synergist (1)
Interferonogenic (3)
Interleukin 6 Inhibitor (1)
Iodothyronine Deiodinase Inhibitor (1)
Irritant (5)
JNK Inhibitor (1)
Juvabional (3)
Keratolytic (2)
Larvicide (1)
Larvostat (2)

Compounds Possessing Activity

IODINE
LINALOOL, TRYPTOPHAN
ARGININE
LYSINE
ASCORBIC ACID, BETA SITOSTEROL, CALCIUM, CAMPESTEROL, CATECHIN, CHROMIUM, COPPER, FIBER, LECITHIN, LINOLEIC ACID, MAGNESIUM, MUFA, NIACIN, NICOTINIC ACID, OLEIC ACID, PECTIN, PHYTOSTEROLS, STEARIC ACID, STIGMASTEROL
ASCORBIC ACID, BETA SITOSTEROL, CHLOROGENIC ACID, CHROMIUM, MANGANESE, NIACIN, NICOTINIC ACID, PECTIN, QUERCETIN, QUERCITRIN, SALICYLATES, SALICYLIC ACID, TRYPTOPHAN
BETA SITOSTEROL, NIACIN
ALPHA LINOLENIC ACID, ASCORBIC ACID, CALCIUM, CHROMIUM, FIBER, GAMMA AMINOBUTYRIC ACID, KAEMPFEROL, MAGNESIUM, PHYLLOQUINONE, POTASSIUM, QUERCITRIN, TRYPTOPHAN, ZINC
LINALOOL
FIBER
KAEMPFEROL
ALPHA TOCOPHEROL, ASCORBIC ACID, CHROMIUM, COPPER, GALLIC ACID, LINOLEIC ACID, MAGNESIUM, SELENIUM, ZINC
AGRIMONIIN, ALPHA LINOLENIC ACID, ASCORBIC ACID, BETA CAROTENE, CAFFEIC ACID, CATECHIN, CHLOROGENIC ACID, ELLAGITANNIN, GALLIC ACID, PHOSPHORUS, PROTOCATECHUIC ACID, SELENIUM, ZINC
GALLIC ACID, P HYDROXY BENZOIC ACID, TANNIN, VANILLIC ACID, ZINC
KAEMPFEROL, QUERCETIN
ALPHA TERPINEOL, FURFURAL, LINALOOL
CAFFEIC ACID, CHLOROGENIC ACID, LINALOOL, LINOLEIC ACID, METHYL SALICYLATE, MUFA, OLEIC ACID, SALICYLIC ACID, THIAMIN
METHYL SALICYLATE, QUERCITRIN
ARBUTIN, GALLIC ACID, NICKEL
NICOTINIC ACID, TRYPTOPHAN
CHROMIUM, MAGNESIUM, QUERCETIN, ZINC
NICOTINIC ACID, TRYPTOPHAN
BETA CAROTENE
ASCORBIC ACID, CHLOROGENIC ACID, ELLAGITANNIN
ALPHA TERPINEOL
KAEMPFEROL
CITRIC ACID, FURFURAL, LINALOOL, MUFA, OLEIC ACID
KAEMPFEROL
CHLOROGENIC ACID, ELLAGIC ACID, QUERCETIN
SALICYLIC ACID, SULFUR
LINALOOL
CHLOROGENIC ACID, QUERCETIN

Biological Activity

Laxative (5)
Laxative? (2)
Leptogenic (1)
Leukotriene Inhibitor (2)
Lipolytic (2)
Lipotropic (2)
Lipoxygenase Inhibitor (7)
Lithogenic (2)
Litholytic (2)
Lubricant (2)
Lyase Inhibitor (1)
Lymphocytogenic (1)
MAO A Inhibitor (2)
MAO Inhibitor (3)
MMP 9 Inhibitor (1)
Mast Cell Stabilizer (1)
Memorigenic (1)
Metal Chelator (2)
Metal Chelator (Copper) (2)
Metalloproteinase Inhibitor (1)
Metastatic (1)
Molluscicide (1)
Monoamine Precursor (1)
Mosquitofuge (2)
Motor Depressant (2)
Mucogenic (2)
Mucolytic (1)
Mutagenic (2)
Mycobactericide (2)
Mycoplasmistat (1)
Myorelaxant (3)
NADH Oxidase Inhibitor (1)
NEP Inhibitor (1)
NF kB Inhibitor (4)
NO Genic (2)
NO Inhibitor (4)
NO Synthase Inhibitor (1)
Natriuretic (1)
Nematicide (5)
Nephrotoxic (4)
Neuroexcitant (1)

Compounds Possessing Activity

CALCIUM, FIBER, MAGNESIUM, SULFUR, VANILLIC ACID
CITRIC ACID, MALIC ACID
ZINC
CAFFEIC ACID, CHLOROGENIC ACID
IMPERATORIN, NICOTINIC ACID
LECITHIN, METHIONINE
CAFFEIC ACID, CATECHIN, CHLOROGENIC ACID, KAEMPFEROL, P COUMARIC ACID, QUERCETIN, TANNIN
ASCORBIC ACID, CADMIUM
CITRIC ACID, MAGNESIUM
PALMITIC ACID, STEARIC ACID
CAFFEIC ACID
ALPHA LINOLENIC ACID
QUERCETIN, QUERCITRIN
KAEMPFEROL, QUERCITRIN, TANNIN
QUERCETIN
QUERCETIN
CHROMIUM
CAFFEIC ACID, CHLOROGENIC ACID
CYANIDIN, QUERCETIN
QUERCETIN
LINOLEIC ACID
IMPERATORIN
TRYPTOPHAN
ALPHA TERPINEOL, LINALOOL
ALPHA TERPINEOL, LINALOOL
BETA CAROTENE, ZINC
ASCORBIC ACID
KAEMPFEROL, QUERCETIN
CITRIC ACID, MALIC ACID
ARBUTIN
CITRAL, GALLIC ACID, MAGNESIUM
QUERCETIN
QUERCETIN
CITRAL, QUERCETIN, SELENIUM, ZINC
ARGININE, CHLOROGENIC ACID
CITRAL, GALLIC ACID, KAEMPFEROL, QUERCETIN
QUERCETIN
KAEMPFEROL
ALPHA TERPINEOL, CITRAL, LINALOOL, LINOLEIC ACID, PALMITIC ACID
CADMIUM, GALLIC ACID, MERCURY, PROTOCATECHUIC ACID
ASPARTIC ACID

Biological Activity

Neuroinhibitor (2)

Neuroprotective (3)

Neurotoxic (2)

Neurotransmitter (2)

Odontolytic (1)

Ornithine Decarboxylase Inhibitor (5)

Osteogenic (1)

Oviposition Stimulant (1)

Ovulant (1)

Oxidant (2)

P450 2B1 Inhibitor (1)

P450 Inducer (1)

P450 Inhibitor (1)

PAF Inhibitor (1)

PGE2 Inhibitor (1)

PTK Inhibitor (1)

Paralytic (1)

Parasiticide (1)

Percutaneostimulant (2)

Perfumery (7)

Peristaltic (1)

Pesticide (37)

Phagocytotic (2)

Phospholipase Inhibitor (1)

Phytoalexin (1)

Pigment (1)

Piscicide (1)

Pituitary Stimulant (1)

Plasmodicide (1)

Polyamine Synthesis Inhibitor (1)

Proinflammatory (1)

Prolactinogenic (1)

Proliferant (1)

Prooxidant (6)

Propeptic (6)

Compounds Possessing Activity

GAMMA AMINOBUTYRIC ACID, GLYCINE

KAEMPFEROL, QUERCETIN, THIAMIN

GAMMA AMINOBUTYRIC ACID, GLUTAMIC ACID

GAMMA AMINOBUTYRIC ACID, MAGNESIUM

CITRIC ACID

CAFFEIC ACID, CHLOROGENIC ACID, QUERCETIN, SELENIUM, TANNIN

PHOSPHORUS

CHLOROGENIC ACID

STIGMASTEROL

ALANINE, HISTIDINE

CITRAL

QUERCETIN

QUERCETIN

KAEMPFEROL

QUERCETIN

QUERCETIN

QUERCITRIN

SULFUR

MUFA, OLEIC ACID

ALPHA TERPINEOL, CITRAL, LINALOOL, METHYL SALICYLATE, MUFA, OLEIC ACID, STEARIC ACID

PECTIN

AGRIMONIIN, ALPHA TERPINEOL, ALUMINUM, ANTHOCYANIN, ARBUTIN, ARSENIC, ASCORBIC ACID, BETA SITOSTEROL, CAFFEIC ACID, CATECHIN, CATECHOL, CHLOROGENIC ACID, CITRAL, CYANIDIN, ELLAGIC ACID, FURFURAL, GALLIC ACID, GENTISIC ACID, KAEMPFEROL, LINALOOL, MALIC ACID, METHYL SALICYLATE, P COUMARIC ACID, P HYDROXY BENZOIC ACID, PALMITIC ACID, PECTIN, PHYLLUQUINONE, PROTOCATECHUIC ACID, QUERCETIN, QUERCITRIN, SALICYLIC ACID, SELENIUM, SULFUR, TANNIN, THIAMIN, VANILLIC ACID, ZINC

BETA CAROTENE, PROTOCATECHUIC ACID

QUERCETIN

P HYDROXY BENZOIC ACID

CYANIDIN

IMPERATORIN

ARGININE

QUERCETIN

SELENIUM

AGRIMONIIN

TRYPTOPHAN

QUERCETIN

BETA CAROTENE, CAFFEIC ACID, CYANIDIN, IRON, LINALOOL, LUTEIN

ALPHA LINOLENIC ACID, CATECHIN, LINOLEIC ACID, OLEIC ACID, PALMITIC ACID,

Biological Activity

Prostaglandigenic (4)
Prostaglandin Sparer (1)
Prostaglandin Synthesis Inhibitor (3)
Prostatitigenic (1)
Protein Kinase C Inhibitor (2)
Protisticide (2)
Psychotropic (1)
Quinone Reductase Inducer (5)
Refrigerant (1)
Retinoprotectant Optometry (1)
Reverse Transcriptase Inhibitor (1)
Roborant (1)
Scabicide (1)
Schizophrenigenic (1)
Secretogogue (2)
Sedative (9)
Serotonergic (2)
Sialogogue (1)
Soap (2)
Spermicide (1)
Spermigenic (2)
Styptic (1)
Sunscreen (3)
Suppository (1)
Sweetener (1)
TNF alpha Inhibitor (2)
Teratogenic (1)
Teratologic (2)
Termiticide (1)
Termitifuge (1)
Testosteronigenic (1)
Thermogenic (1)
Thymoprotective (1)
Thyrotropic (1)
Tineacide (1)
Topoisomerase I Antagonist (1)
Topoisomerase I Inhibitor (4)
Topoisomerase II Inhibitor (3)

Compounds Possessing Activity

STEARIC ACID
CAFFEIC ACID, P COUMARIC ACID, P HYDROXY BENZOIC ACID, PROTOCATECHUIC ACID
SELENIUM
ALPHA LINOLENIC ACID, P COUMARIC ACID, QUERCETIN
CITRAL
QUERCETIN, SELENIUM
IODINE, KAEMPFEROL
TANNIN
CATECHOL, ELLAGIC ACID, KAEMPFEROL, LUTEIN, QUERCETIN
CITRIC ACID
LUTEIN
ELLAGITANNIN
ASPARTIC ACID
SULFUR
COPPER
P HYDROXY BENZOIC ACID, PROTOCATECHUIC ACID
ALPHA TERPINEOL, CAFFEIC ACID, CITRAL, GAMMA AMINOBUTYRIC ACID, IMPERATORIN, LINALOOL, NIACIN, STIGMASTEROL, TRYPTOPHAN
NIACIN, TRYPTOPHAN
MALIC ACID
PALMITIC ACID, PALMITOLEIC ACID
BETA SITOSTEROL
ARGININE, ZINC
GALLIC ACID
CAFFEIC ACID, CHLOROGENIC ACID, ELLAGIC ACID
STEARIC ACID
CHLOROGENIC ACID
KAEMPFEROL, QUERCETIN
CITRAL
KAEMPFEROL, QUERCETIN
ALPHA TERPINEOL
LINALOOL
ZINC
SALICYLIC ACID
BETA CAROTENE
IODINE
SALICYLIC ACID
ELLAGIC ACID
GALLIC ACID, KAEMPFEROL, PEDUNCULAGIN, QUERCETIN
KAEMPFEROL, PEDUNCULAGIN, QUERCETIN

Biological Activity

Toxic (1)
Tranquilizer (3)
Transdermal (1)
Trichomonicide (3)
Trypanocide (1)
Tumor Promoter (3)
Tumorigenic (2)
Tyrosinase Inhibitor (6)
Tyrosine Kinase Inhibitor (1)
Ubiquitot (6)
Ulcerogenic (2)
Uricosuric (4)
Urinary Acidulant (1)
Urinary Antiseptic (1)
Urine Acidifier (1)
Urine Deodorant (1)
Uterorelaxant (1)
Uterotrophic (1)
VEGF Inhibitor (2)
Vasodilator (10)
Vasopressor (1)
Vulnerary (6)
Xanthine Oxidase Inhibitor (8)
cAMP Phosphodiesterase Inhibitor (2)
iNOS Inhibitor (2)

Compounds Possessing Activity

PHYLLUQUINONE
CALCIUM, GAMMA AMINOBUTYRIC ACID, MAGNESIUM
ALPHA TERPINEOL
CITRAL, LINALOOL, ZINC
CITRAL
CATECHOL, LINALOOL, TRYPTOPHAN
CAFFEIC ACID, QUERCETIN
ARBUTIN, CITRAL, KAEMPFEROL, P COUMARIC ACID, PROTOCATECHUIC ACID, QUERCETIN
QUERCETIN
BETA CAROTENE, BETA SITOSTEROL, LUTEIN, P HYDROXY BENZOIC ACID, PROTOCATECHUIC ACID, VANILLIC ACID
BETA SITOSTEROL, SALICYLIC ACID
ASCORBIC ACID, FOLACIN, GLYCINE, SALICYLATES
ASCORBIC ACID
ARBUTIN
METHIONINE
METHIONINE
MAGNESIUM
KAEMPFEROL
QUERCETIN, SELENIUM
ALPHA LINOLENIC ACID, ARGININE, ASCORBIC ACID, CALCIUM, FIBER, KAEMPFEROL, MAGNESIUM, NIACIN, POTASSIUM, QUERCETIN
QUERCITRIN
ALPHA TERPINEOL, ASCORBIC ACID, CAFFEIC ACID, CHLOROGENIC ACID, NEO CHLOROGENIC ACID, ZINC
CAFFEIC ACID, CATECHIN, ELLAGIC ACID, FOLACIN, GALLIC ACID, PEDUNCULAGIN, QUERCETIN, TANNIN
KAEMPFEROL, QUERCETIN
KAEMPFEROL, QUERCETIN