

UPCYCLING IN THE GARDEN: BUILD A PALLET PLANTER

MAXIMUM YIELD

JAN/FEB 2021

A COMPLETE GUIDE FOR THE MODERN GARDENER

pH BALANCE FOR EFFICIENT NUTRIENT UPTAKE

**HOT CONDITIONS AND
HYDROPONIC
PRODUCTION**

**SMALL-SPACE GROWING
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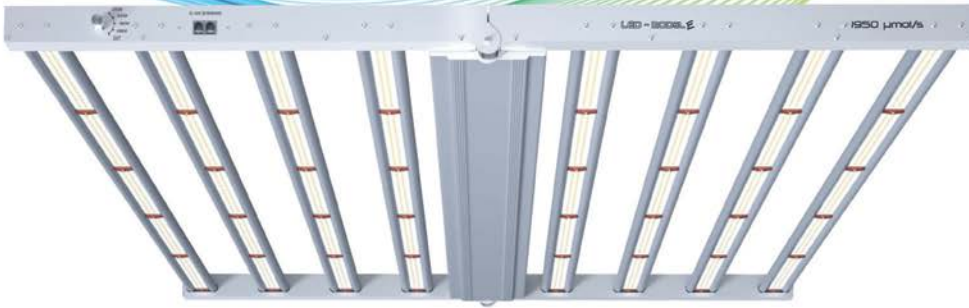
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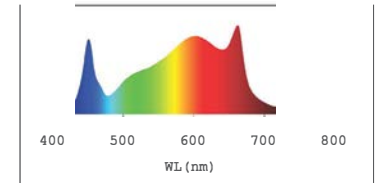
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- Total Amps: 2.83 A



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LED - UFO 300 W & 500 W

300 W UFO LED

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- Optimum Driver
- 400 mm $\varnothing$ - 200 mm H
- Total Amps: 1.25 A

500 W UFO LED

- Total PPF 1050 $\mu\text{mol/s}$
- 2.1 $\mu\text{mol/J}$
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“

Each type of plant needs certain growing conditions to thrive. It really is worth the time and effort to monitor and adjust pH levels in hydroponic systems.”

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Features

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pH Balance for Efficient Nutrient Uptake

by Rich Hamilton

One of the most important yet overlooked factors in hydroponics is nutrient levels or, more specifically, your pH levels. Learn how to keep a good pH balance and maximise nutrient uptake in your hydro system.

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Building a Pallet Planter: Getting Started

by Chris Bond

Pallet planters look good, reuse discarded materials, and let you put your plants in the best possible location. Check out how to get started with a pallet planter project.



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“
Sure enough,
a few weeks
later, the pallet
planter, which we
put on our sun-
drenched deck,
was brimming
with tomatoes, hot
peppers, various
herbs and leafy
greens, Brussels
sprouts, chives,
and much more.”



from the EDITOR

TG Toby Gorman

On a beautiful June morning at the height of our lockdown where we are, I awoke to hammering, the screeching of nails being pulled from wood, and the sharp whirr of a mitre saw ripping through the morning quiet. Bleary-eyed, I followed the noises to the garage where my wife, Mary, tool belt on and coffee in hand, was standing over a half-built pallet planter. Unapologetically smiling, all she said was “This is going to be awesome!” I wasn’t sure I shared her enthusiasm, or her vision, at that hour, certainly not before my morning tea, but as with most of her projects, her vision goes well beyond mine. Sure enough, a few weeks later, the pallet planter, which we put on our sun-drenched deck, was brimming with tomatoes, hot peppers, various herbs and leafy greens, Brussels sprouts, chives, and much more. It was uncanny how much food was produced in such a small space. We canned the peppers and enjoyed them for weeks on many of our favourite Mexican dishes, the tomatoes just kept coming and showed no signs of stopping until late October, and the herbs and leafy greens were used all summer in various recipes, salads, and soups.

With this inspiration in mind, for this issue we asked contributor Chris Bond to put

together an article on how to build a pallet planter and some things to consider before you begin the project (Building a Pallet Planter: Getting Started, page 32). There are several different configurations you can make depending on your space constraints, but as long as there is available sunshine it’s as easy as building the planter, filling it with soil, seeds, and some water, and watching it all come to life. If construction isn’t your thing or you don’t have a suitable place for a pallet planter, don’t worry. We asked Monica Mansfield to research the best ways to grow veggies in tight quarters, and she came back with some great tips and ideas that will fill your apartment or tiny house with fresh goodness. You can find “5 Ways to Grow Veggies in Your Tiny House or Apartment” on page 48.

If you’re like millions of people around the world who turned to gardening during the pause, perhaps this year you’re looking to improve on your gardening skills and dive a little deeper into how to grow a great garden. Whatever your motivation for gardening, be it food security, learning new skills, or a need to complete projects around the home and property, it’s a great way to stay focused, productive, and self-sustaining. 

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Featured Contributors

RH **Rich Hamilton** has been in the hydroponics industry for more than 20 years, working originally as a general manager in a hydroponics retail outlet before becoming an account manager at Century Growsystems. He enjoys working on a daily basis with shop owners, manufacturers, distributors, and end-users to develop premium products.

CB **Chris Bond's** research interests are with sustainable agriculture, biological pest control as well as alternative growing methods. He is a certified permaculture designer and certified nursery technician in Ohio and a certified nursery professional in New York, where he got his start in growing.

Contributors

+ **Monica Mansfield**
Phil McIntosh
Dr. Lynette Morgan



pH



pH is the measure of acidity/alkalinity of a solution. pH is a key measurement in hydroponics because the acidity or alkalinity of a nutrient solution determines the availability of nutrients for uptake by plants.

The term "pH" stands for "potential hydrogen." pH tests measure the concentration of hydrogen in relation to hydroxide in a nutrient solution. If a nutrient solution has an equal concentration of hydronium and hydroxide ions, it is neutral (pH 7.0). If said nutrient solution contains more hydrogen ions than hydroxide ions, it is acidic (pH 0-6.9). If it contains more hydroxide ions, it is alkaline (pH 7.1-14). The scale is logarithmic, not linear, a pH of 6 indicates 10 times more hydrogen protons than a pH of 7, and a pH of 5 indicates 10 times more protons than a pH of 6.

Maximum nutrient availability generally occurs in hydroponic solutions at pH readings between 5.5 and 6.5. Many factors can affect pH levels. Constant testing and monitoring is key to successful pH management.

Check out Rich Hamilton's article on page 26 for more information.

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“

*...the buds do not have a PGR look to them and they look natural almost
organic in their structure... the bud sites are huge and filled with resin!*

(USA Commercial consultant)

”

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“I found my closed RDWC system far more wasteful than I was expecting. In a 15-gallon capacity sytem i couldn't really get more than 2-3 weeks before it would go so acidic I couldn't control it. Not sure if I'm just using too much cal/mag or this is just a result of running out of nitrogen and the plants are creating carbonic acid as a response?”

I change out RDWC systems water every 7 days to help reduce pH fluctuations and keep system clean.
— @4treesbuilding.ca

If you don't change the water root exudates build up to the point where pathogens will grow. If you have issues dumping out that water because it's a “waste” then use it as fertiliser or water for other plants (preferably outside as naturally occurring soil microorganism will filter out the root exudate and pathogens.) 🙌 waste not, want not.
— @bush.root.organics



@therealshuko

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DO YOU HAVE A QUESTION FOR A GROWER? Email editor@maximumyield.com or [facebook.com/maximumyield](https://www.facebook.com/maximumyield)

ask a GROWER

by Monica Mansfield

Q I've got a 20x30 ft. garden plot in my backyard I use to grow vegetables, Swiss chard, and lettuce. I add composted soil every spring and have always tilled the soil before planting. I've read tilling may be harmful. Is not tilling better for my soil?

– *Angelique B.*

a Thank you for your question. The short answer is that either method will work, but tilling does harm your soil over time and will require more inputs over the years to keep your plants healthy.

The reason tilling works well for a while is because when you till the soil you are killing the soil life, which releases a burst of nutrients into the soil and jump starts your garden in the spring. While tilling yields great results in the short term, over time the soil life is destroyed, and the soil eventually dies. When this happens, your garden becomes completely dependent on fertilisers to feed your plants. You can grow a successful garden this way, but it becomes expensive, time consuming, and labour intensive.

When you don't till, you allow the soil life to flourish. This underground ecosystem creates healthier soil that requires fewer amendments and fertilisers from you as the years go on. You are basically allowing the soil life to do a large part of your gardening chores for you by working the soil and creating nature's very own nutrient recycling system.

Beneficial bacteria attach to the plants' root systems and eat their root exudates. Their waste, in turn, becomes readily available food for your plants. The beneficial fungi break down organic matter and establish an underground

network of hyphae, or threadlike filaments, off of the plants' root systems. Beneficial bacteria can travel further distances along these underground highways and bring nutrients back to their host plant. The earthworms tunnel through the soil, tilling for you, and leave their castings along the way to feed the other soil critters. Beneficial nematodes and arthropods keep harmful pest populations in check. Together, this cast of characters creates rich, living soil that nourishes your plants, reduces harmful pests, and protects against diseases.

When you till, you destroy nature's system and have to replace it with synthetic fertilisers and pesticides. This becomes costly and is nowhere near as effective. When you don't till, all you need to do is layer some compost and mulch on top of your soil in the fall and let it decompose over the winter months. You'll need to do this every year for a while, but over time you'll only need to add compost every other year or every few years for superior results with less work from you.

I don't till and my garden grows better with each passing year. With the results I get, I'll never till again. 

Hope this helps and happy growing!
Monica Mansfield

MM **Monica Mansfield** is passionate about gardening, sustainable living, and holistic health. After owning an indoor garden store for 5½ years, Monica sold the business and started a 6.5-acre homestead with her husband, Owen. She writes about gardening and health, as well as her homestead adventures on her blog at thenaturelifeproject.com.

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Danger of Micro and Nanoplastics in Plant Root Cap

Over the last decade, scientists have been scrambling to understand the impacts of microplastics. In soil, plastics have the potential to cause problems at the chemical level. Like a magnetic attraction, contaminants can bind to plastics, resulting in toxic accumulation. While microplastics (MPs) cannot get into plant cells, they can accumulate on the tips of roots and get into root crops like carrots and lettuce. For decades, scientists believed that plastic particles were simply too large to pass through the physical barriers of intact plant tissue. But a new study disproves this assumption. "Cracks at the emerging sites of new lateral roots of lettuce and wheat crops can take in MPs from the surrounding soil and water. Those MPs can then be transferred from the roots up to the edible parts of the crop," said Prof. Luo Yongming, a professor both at the Yantai Institute of Coastal Zone Research (YIC) and the Nanjing Institute of Soil Science of CAS.

– [freshplaza.com](#)

Making Soil on Mars?

Humankind's next giant step may be to Mars, but scientists still need to make many breakthrough advances, including how to grow crops on the red planet. Since astronauts cannot haul an endless supply of topsoil through space, University of Georgia geologists are figuring out how best to use the materials already on Mars's surface. To do that, they developed artificial soil mixtures that mimic materials found on Mars. In a study published in the journal *Icarus*, researchers evaluated the artificial soils to determine just how fertile Martian soil may be. "We want to simulate certain characteristics of materials you could easily get on Mars's surface," says Laura Fackrell, lead author on the study. Despite its thin atmosphere, extreme cold, and low oxygen, Mars's surface contains most plant essential nutrients, including nitrogen, phosphorus, and potassium, but Fackrell is concerned plants may not be able to access these nutrients on Mars. "If you actually put a plant in the ground – just because the iron or the magnesium is there doesn't mean the plant can actually pull it out of the soil," she says.

– [sciencedaily.com](#)

Cultivator Teaches Growing via TikTok

For one grower, the power of social media is an effective way to connect and teach others about cultivating produce during the pandemic. "The floor is full of onions. What the heck is going on? Why do we have so many onions down there?" Those are the questions Shay Myers of Parma, ID-based Owyhee Produce, a grower who's been producing regular videos on TikTok, asks viewers on one of his recent videos. "TikTok was a platform that was up and coming, especially in the early COVID times. The videos are a similar concept to my LinkedIn content – sometimes it crossed over, so it just made sense to post content there as well," says Myers. After posting snippets on LinkedIn, he switched over to TikTok, where videos easily go viral as the algorithm shares content broadly with like-minded people. Myers produces some four to five farming and produce-related videos a week for his 221,100 followers.

– [freshplaza.com](#)

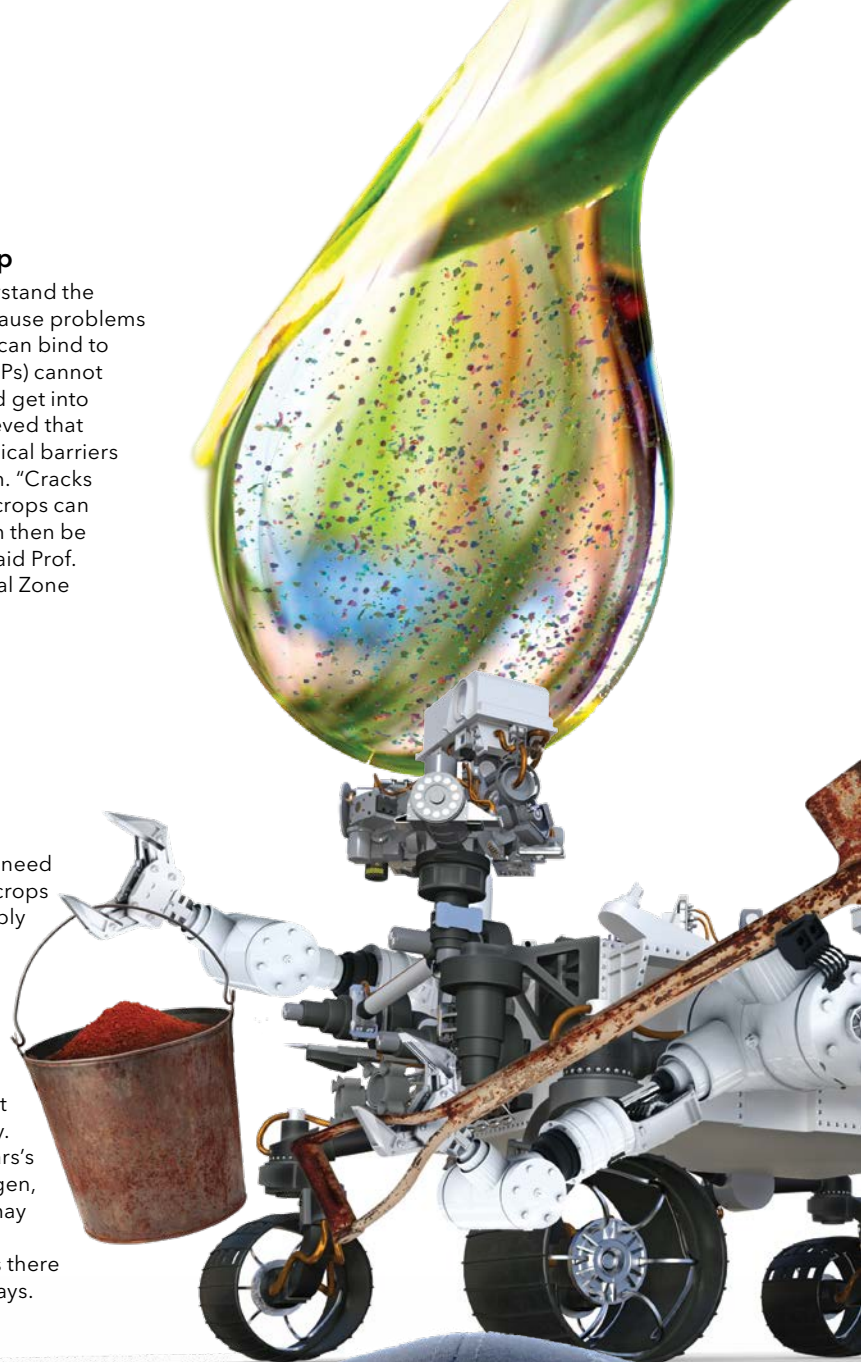


image courtesy of [owyheeproduce.com](#)

Biostimulant Improves Vertical Farm Efficiency

While vertical farming (VF) is a source of high-quality, accessible, and climate-friendly nutrition for rapidly growing urban populations, it has a long way to go in order to ensure it can be industrialised on a massive scale and extended beyond leafy greens and fruits into the production of food staples or row crops. While technological advances have improved the energy efficiency of VF lighting systems, there has been insufficient research into biological approaches to save energy by shortening the growth period from seed to harvest. A company called Back of the Yards Algae Sciences conducted a controlled trial to evaluate the biostimulant potential of a phycocyanin-rich *Spirulina* extract (PRSE) in vertically farmed lettuce. PRSE application reduced the time from seeding to harvest by six days, increased yield by 12.5 percent, and resulted in much improved lettuce quality. This preliminary study demonstrates that biostimulants may play a key role in improving the economic sustainability of the rapidly growing VF sector.

– hortidaily.com

Smallest Tomato Packs Big Flavour

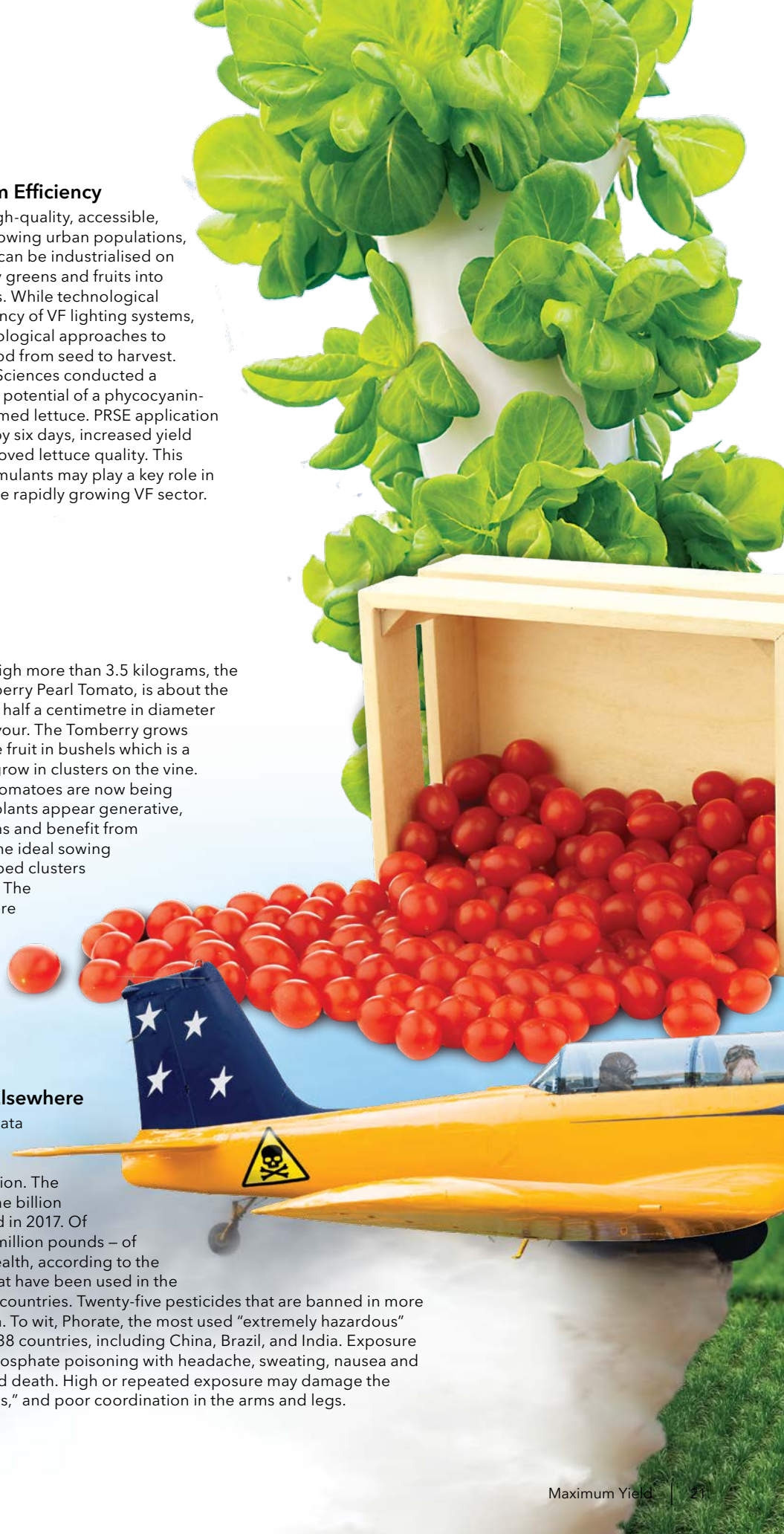
While some of the largest tomatoes can weigh more than 3.5 kilograms, the smallest tomato variety, known as the Tomberry Pearl Tomato, is about the size of a small blueberry. It measures about half a centimetre in diameter but still manages to pack plenty of juicy flavour. The Tomberry grows much like wild berry or grapes, growing the fruit in bushels which is a big difference from regular tomatoes that grow in clusters on the vine. Developed in The Netherlands, Tomberry tomatoes are now being grown in North America. Even though the plants appear generative, they do need generative growing conditions and benefit from being grafted on a generative rootstock. The ideal sowing temperature is around 25°C. The bush-shaped clusters consist of around 130-150 fruits per cluster. The clusters are harvested as a whole, when more than 70 percent of the fruits are mature.

– maximumyieldstaff

U.S. Still Using Pesticides Banned Elsewhere

A recent review of U.S. Geological Survey data shows America uses 150 agricultural pesticides that are considered "hazardous" by the World Health Organization. The geological survey estimated that at least one billion pounds of agricultural pesticides were used in 2017. Of that, about 60 percent – or more than 645 million pounds – of the pesticides were hazardous to human health, according to the WHO's data. Many hazardous pesticides that have been used in the U.S. for decades are banned in many other countries. Twenty-five pesticides that are banned in more than 30 countries were still used in America. To wit, Phorate, the most used "extremely hazardous" insecticide in the U.S. in 2017, is banned in 38 countries, including China, Brazil, and India. Exposure to Phorate can cause rapid, fatal, organophosphate poisoning with headache, sweating, nausea and vomiting, diarrhea, loss of coordination, and death. High or repeated exposure may damage the nerves causing weakness, "pins and needles," and poor coordination in the arms and legs.

– inthesetimes.com





1 | Agrolux 600W E-Ballast

Agrolux's 600W E-Ballast is an all-in-one unit for MH, HPS, and CMH dimmable grow lights. With its wide range of settings, it can run 12 different lamps at 250W, 400W, 600W MH and HPS +315W, and 600W CMH lamps. It features digital random start technology with electronic ignition. This ballast is fan-less, cool, and boasts a 10 percent PAR output. It has a 2.7A draw at 600W and features "intelligent hot lamp ignition."

2 | Bio Diesel Marine CaMg+

A growth enhancer, Marine CaMg+ is designed specifically for medical cultivation with naturally derived ingredients from the sea, including crustacean-derived chitin for high levels of natural micronized calcium and trace elements. Marine CaMg+ provides fast-acting nitrogen and 100 percent natural growth stimulants from the sea for faster, lush growth and heavy yielding branches. It encourages plant cell division and growth rates, while promoting increased tolerance to stress and insects. Marine CaMg+ can quickly correct nutrient deficiencies of calcium, magnesium, or nitrogen.

3 | ARS Scissors Flower Snips

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4 | Reiziger Grow Food A&B

Reiziger's Grow Food A&B is a full-spectrum nutrient designed without compromise to enhance the cultivation of all crop specific strains. Grow Food A&B is free of contaminants and derived from pure nutritive ingredients. It helps stabilise pH, guarding crops against fluctuation stress and nutrient deficiencies. The balanced formula provides macro, secondary, and fully chelated micronutrients, plus innovative and revolutionary patented phosphorus facilitates better absorption by the roots. Reiziger Grow Food A&B nutrients are designed for use in all hydroponic growing media, both recirculating and non-recirculation systems.

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5 | Reiziger Peat Mix

Intended to push the boundaries of design and manufacture, Reiziger Peat Mix contains Sphagnum moss peat that is sustainably harvested from raised European peat deposits and blended with the most exceptional and purest ingredients: calcium, magnesium, coloured peat, coconut coir pith, and root-growth feed to give plants a quick boost to get them off to the best start. Its formula is remarkably effective, providing plants with the optimum balance of air and water resulting in strong roots to grow healthy, beautiful plants.



6 | Eco Organic Garden Eco Oil

Eco-oil is a registered organic miticide and insecticide that controls a range of problem insects including scale, aphids, two-spotted mite, whitefly, mealybugs, and citrus leafminer moths. It's safe for use on vegetable, as well as ornamentals, with no withholding period. Eco Oil is made of 100 percent plant oils and is HIPPO-enhanced to attract beneficial insects. It's GM free and safe to spray and eat on the same day, while being safe for beneficial insects like bees, ladybugs, and earthworms.



7 | Grow Genius Mono-Silicic (40 Percent)

Now available in Australia, Grow Genius Mono Silicic contains the most pure and concentrated plant-available Mono Silic. Don't be fooled by products offering only 1.2 percent. Grow Genius 40 percent Mono Si is 100 percent pure and contains no added buffer minerals. Growers will experience increased strength, root mass, pest and disease protection, higher brix, and increased tolerance to environmental stress. It's available from Supreme Gardens wholesale and leading hydro stores throughout Australia.



8 | HarveMax Portable 2-Speed Clip-on Fan

HarveMax 150mm (2-inch) clip-on fans have a reliable 20W motor with improved bearing quality for longer expected life. HarveMax clip-on fans feature a strong rubber lined clamping mechanism allowing them to clip onto poles (they are perfect for grow tents), desks, or shelves. They are tilt-adjustable (both up or down) and oscillate 90 degrees. HarveMax fans come with a one-year warranty. Find it through Growhard Australia.



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pH BALANCE FOR EFFICIENT NUTRIENT UPTAKE

by Rich Hamilton

One of the most important yet overlooked factors in hydroponics is maintaining your nutrient levels or, more specifically, your pH levels. Check out how to keep a good pH balance and maximise nutrient uptake in your hydro system.

Plants can only absorb hydroponic nutrients when the pH is within the ideal range, which is generally between 5.8-6.5. If your solution's pH is not within this range, then your plants will be unable to absorb enough nutrients which will impair them in carrying out all the necessary processes that allow them to thrive in otherwise ideal conditions.

Fear not, however, as we will look at what pH your hydroponic system needs and how you can properly monitor and maintain its levels through accurate use of nutrient feed.

Importance of pH Level

The pH scale ranges from 0 to 14, with 0 being the most acidic, 14 being the most alkaline and 7 being the pH-neutral point. All plants are different, however, and some prefer acidic conditions while others may require an alkaline environment.

A pH that is too high/alkaline can prevent nutrient uptake and lead to deficiencies. Iron deficiency causes pale or yellow leaves in young plants, while leaf cupping and tip burn are both signs of calcium deficiency. Calcium also tends to form salts that leave white deposits or scale on your reservoir walls and equipment, which in turn can cause blockages and poor water circulation through your system.

First, you should always use a feed specifically tailored for hydroponic systems because plants grown via hydroponics require different pH levels than grown in soil. Soil already has plenty of beneficial microorganisms and organic matter to help your plants grow. Its naturally rich makeup also allows for interactions between water and minerals that can help regulate pH levels. Without this you must be vigilant and thorough, constantly monitoring and adjusting pH levels. There are of course some exceptions, however, as the optimal pH range for hydroponically grown crops sits in the near-neutral range between 5.5-6. Many fruits and vegetables such as melons, apples, beans, squash, and tomatoes prefer that range. Some fruits and vegetables have a wider optimal pH range, such as pumpkin which requires a pH between 5.5-7.5. Likewise, other crops like things a bit more alkaline including kale, onions, and peas, which prefer levels between 6.0-7. Mint likes it super alkaline at 7.0- 8.0.



"You should always use a feed specifically tailored for hydroponic systems because plants grown via hydroponics require different pH levels than grown in soil."

Hydroponic Nutrients and pH Range for Plant Uptake

Hydroponic nutrient product ranges typically start with pH levels between 5.5-6.0 but can vary depending on their individual formulation. For example, ammonium nitrate is more acidic than nitrate and will cause a drop in pH (more acid). Calcium salts, on the other hand, can cause a rise in pH (more alkaline). Each nutrient is unique and requires certain pH levels to make for efficient plant uptake. The wrong pH level can result in too little or too much of a certain nutrient being taken up by the plant. For example, when the pH level drops below 5.0, plants can stop or "lock out" any uptake of magnesium and calcium resulting in deficiencies, while in contrast, it can cause copper and iron toxicity as these nutrients thrive at a slightly lower pH. A pH level that exceeds 6 or 6.5 can also induce an iron deficiency.

“To get an accurate pH reading in a media-based system, test the pH of the reservoir solution as well as the run-off draining from the pots, beds, or bags holding the plants.”

Why pH Levels Fluctuate in Hydroponic Systems

There are several reasons why you could see pH levels fluctuating within your hydroponic systems. One of these is because plants can absorb more water than nutrients if needed, which can then cause massively varying pH levels. It is therefore important to monitor nutrient solution levels by testing pH and EC. You should keep the reservoir full by replacing it with a fresh feed when pH levels are too far out of range. Do not just top up the reservoir in this scenario as the solution that is left has a higher pH and will increase the strength of the new feed you add, meaning you are back to square one.

Both inorganic and organic matter can affect pH levels in hydroponic systems. To get an accurate pH reading in a media-based system, test the pH of the reservoir solution as well as the run-off draining from the pots, beds, or bags holding the plants.

Algae and bacteria are the main types of organic matter that affect pH levels in a hydroponic system. If pH levels rise in the morning and drop later in the day, algae may be the culprit.



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As algae consume acidic carbon dioxide during the day, pH levels rise and then fall by evening. On the other hand, bacteria from root disease can cause a dramatic drop in pH levels. As diseased roots decompose, bacteria will release acids into the hydroponic solution.

The first and most important factor in maintaining liquid nutrient levels in hydroponics is constantly testing and monitoring pH levels. There are a variety of ways to do this including test strips and liquid test kits (that are the least expensive) as well as digital pH meters that are more expensive but provide accuracy and offer repeatable results. I would recommend testing your pH at least every other day or on a daily basis if you have recently adjusted nutrient levels or are just starting out in hydroponics.

If you are using a recirculating system you should adjust the pH level according to test results from the main reservoirs. In a media-based system, however, the pH will change as the nutrient solution travels through the system and out as “run-off.” Therefore, you should test and adjust your pH levels based on the pH of your run-off.

Products for Balancing pH

There are ready-made products you can buy to help correct any issues with incorrect pH including “pH up,” which is made up of phosphoric acid, and “pH down,” which is made up of potassium hydroxide. Be warned: it is easy to overdose with pH down and pH up and it is more damaging to add too much pH down or pH up than having solution that isn’t in the ideal range. For this reason, you should only use pH down or pH up very sparingly and adjust pH to your chosen level over the course of several days.

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Be sure to only use a feed range suited for hydroponic growing. Organic elements that are contained in feed ranges designed for use with other mediums or systems can ferment when used in a hydro system, causing residue and algae that can damage your pH, plants, and equipment.

If you want to be as accurate as possible but don't have the time to manually check your pH levels every day then you can purchase automatic pH controllers. These cost more than pH up or pH down products, but they will maintain your pH at a consistent level. Automatic controllers are a great choice if you are using a recirculating system where pH fluctuations regularly occur as your plants feed themselves repeatedly from the same solution.

The type of water that you use is important also. If your water is hard, the buffering effect from the high mineral levels will cause high pH levels. If this is the case, then a reverse osmosis system is an efficient and affordable method for reducing water hardness. Reverse osmosis is the process where any contaminants or dissolved minerals that may cause water to be hard are removed by forcing the water through a filter.

Each type of plant needs certain growing conditions to thrive. It really is worth the time and effort to monitor and adjust pH levels in hydroponic systems. If you know the optimal pH ranges for your plants, you can take the necessary steps to keep your hydroponically grown plants in the best of health. 🍷



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BUILDING A PALLET PLANTER

Getting Started

Pallet planters look good, reuse discarded materials, and let you put your plants in the best possible location. Chris Bond helps you get started with your pallet planter project.

by Chris Bond

Reusing materials is both economical and environmentally savvy. Nature provides numerous examples of recycling resources. Frugal-minded gardeners have been reusing the bounty of nature for millennia and the surplus materials of various industries for centuries. Incorporating pallets into the garden is just one of the more recent great garden-recycling ideas to come down the pike. There are literally as many different options for pallet garden construction projects as there are the number of people that build them.





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Why Use Pallets?

Pallets are generally a throw-away item to many businesses. They are abundant, cheap, or even free to obtain. Many businesses give them away so they do not have to pay for their removal. Since most pallets are made out of wood, they are a renewable resource, so people can feel good about not only reusing an item that was earmarked for a landfill, but by using something that is also made from trees. They are also a conscientious choice because there are unlimited possibilities with what can be created out of pallets.

One of the great things about pallets as a building material for garden planters is they are readily available. Almost every home or garden store, national or locally owned, has stacks of them behind their buildings or in their receiving areas. Essentially, any business that receives merchandise or supplies via truck will have received them on pallets. It is important to note that although pallets are generally considered to be refuse, some businesses pay deposits on pallets and are not able to part with them. This means it's important to check the status of pallets with their rightful owners so you are not charged with theft by taking any pallets that might appear at first glance to be garbage. It would be pretty embarrassing to be thrown in the slammer for scavenging pallets to build a garden planter.

If locating free pallets proves to be a challenge, there are many companies that deal in the business of used pallets. These folks range from a guy in a pickup truck scavenging in the same locations that you might think of to large-scale refurbishing operations that churn out thousands of rebuilt pallets each day. These larger operations will often collect pallets, sometimes even buy them, then repair and resell them. Having to pay for used pallets is obviously not as good as getting them for free but will of course be cheaper than buying them new.

Not Just Any Pallets

As with anything you can obtain for free, it's important to assess what you are looking at and how much work will be needed to make your pallets usable for your pallet planter. There is a standard pallet size of 1.2x1 metres. There are probably more pallets out there that don't conform to this standard than do, though. You can find pallets in almost any size and dimension imaginable. If uniformity is important for your pallet project, make sure to check that you do not have any odd sizes or you may need to do a lot of awkward cutting. If you are only using one pallet for your planter, then this is not likely an issue and the size probably will not matter.

The type of wood is important if you are intending to grow food items in your pallet planter. Wood pallets vary between softwoods and hardwoods; treated and untreated. Softwood pallets, such as pine, are not usually reused or meant for long-term usage. Hardwood pallets are better for pallet planters and other garden projects. Treated wood pallets should be avoided. If the letters "MB" appear on the pallet, reconsider it. This means it was treated with methyl bromide, a fumigant, that is toxic to humans. If it appears that any oil or chemical has been spilled onto a pallet, then its use should also be reconsidered. In general, look for clean pallets that have either "HT," which indicates that the pallet has been heat treated, or look for those that have "KD" stamped on them indicating that the pallet has been kiln dried. Either "HT" or "KD" pallets are safe to reuse for pallet planters. Some pallets have square blocks that separate the stringers from the planks. These blocks are often made of compressed wood or sawdust and often have carcinogenic material used to bind them together. Avoid these if you are planning on using your pallets to grow food crops.

The condition of the pallet must be taken into consideration as the older the pallet, then often, the shorter the useful life of the pallet, though this has more to do with the type of wood used, and environment in which it had been used or stored in. Depending on what you want your finished pallet planter project to look like, there will be some prep work to consider. First, check that there are no loose, broken, or missing boards on your pallet. Any of these can be easily remedied by either adding more nails or replacing broken or missing boards with the boards of another pallet.

“

There are literally as many different options for pallet garden construction projects as there are the number of people that build them.”





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Remove any remnants of shipping. There might be metal or plastic bands, staples, or straps that may still be attached. There may also be metal bits or nails sticking out that should either be removed or pounded down before using for your planter project. If you are expecting to stain, paint, or otherwise treat the surface of your pallet planter, then it may need to be sanded. Pallet wood can often be rough and require a lot of sanding to create a smooth surface. This is especially important to consider if your pallet is stamped "MB" as sanding will release toxins you should not breathe in.

Find a Design

Once your pallet materials are ready to go, the sky is the limit as far as design options. Many pallet planters are as simple as an upright pallet leaning against the wall. You can plant right in the slots of the pallet by adding a "bottom" where needed and some soil. This can be done by using a pallet plank from another pallet, other scrap wood, or a piece of landscape fabric that has been stapled into place. Additionally, a vertical pallet might also simply be used as a platform to hang pots or other planters on or from. This can be done with clamps around canning jars, recycled plastic bottles, hooks, and coffee cans or any other container that is suitable for the planting or seeding of flowers or crops. Other folks may combine multiple pallets to create a living wall effect or combine pallets into a geometric design that has many "walls." The most basic pallet planter, though, is just a pallet laid horizontally on the ground and filled with soil. It is among the simplest ways to achieve a raised bed and it's easy to keep your veggies or flowers in neat rows. Pallets do not, however, need to be kept in their original form to be useful planter material.

Pallets can be cut into an infinite number of sizes and configurations. They can be used to create window-box planters or stand-alone planters. The design of pallets and various stacking combinations lend themselves well to creating layered gardens or planters that have plants growing on not just the top, but all four sides as well. To take pallet planters to the next level, they can be used to construct a cold frame or mini greenhouse when combined with a translucent cover. When placing pallets for cold frame or greenhouse walls, the gap between the stringers and the planks on a typical pallet can be filled with soil or any other material for insulation to add additional resilience to the pallet planter cold frame. Construct these along the south side of your house



or building for maximum efficiency.

Pallet planters and their various derivations are not the only useful and unique projects that can be created with these versatile shipping platforms. Many other equally cool yard and outdoor projects can be done using disposed-of pallets like potting benches. Some creative folks make unique furniture out of pallets. Chairs, tables, swings, and benches are among many such creations. Sheds are another example of a repurposed usage of pallets. Storage sheds, or potting sheds can be partially or wholly made from old pallets. Sand boxes and outdoor toy storage are other items that can be made from discarded pallets. Treehouse builders sometimes make use of pallets in their construction. Other people use them to build decks, stairs, walkways utilising the pallet boards, or a wide range of other outdoor structural elements to their landscape.

An image search of "pallet projects" will yield thousands of examples of outdoor and planter projects that people have accomplished using these versatile materials. There is an almost infinite number of projects, both useful and whimsical, that can be created using pallets. 🌱

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A vertical pallet
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IDEAS FOR eco-friendly GARDENS

by Monica Mansfield

Everything in nature is connected. The more you make use of Mother Nature's methods, the happier your garden and the environment will be.





As gardeners, we have a symbiotic relationship with the Earth. We nurture the soil and plants in our garden, and are given delicious food, medicinal herbs, and beautiful flowers in return. Our physical health is directly affected by the health of our soil and our environment. If we implement eco-friendly gardening techniques, and avoid harmful practises, we can make a positive impact on our environment. If we all pull together, our impact can be massive.

MAKE YOUR OWN COMPOST

According to the Environmental Protection Agency, municipal waste includes 13 percent yard waste, 12 percent food waste, and 34 percent paper, most of which can be composted. By composting your waste, you can significantly reduce how much trash you send to the landfill.

To top it off, you'll be rewarded with black gold to fertilise your garden. Compost is a significant source of nitrogen, phosphorus, and potassium, along with a broad range of micronutrients. It improves the tilth, aeration, and water-holding capacity of your soil, and regulates soil pH. Compost promotes beneficial microbes in the soil, which play an essential role in nutrient uptake. It is the supreme slow-release fertiliser and soil conditioner.

There are many ways to create your own compost, even if you don't have much space. If you live in an apartment, you can start a worm bin for your kitchen scraps. You can purchase a barrel composter if you have a small yard and want to keep things looking tidy. If you have a larger yard, you can set up a three-bin composting system. And if you have room for a chicken coop, you can use the deep-litter method in your run to make a nitrogen-rich compost from chicken manure, animal bedding, yard waste, and kitchen scraps.

GARDEN WITH CHICKENS

That brings us to gardening with chickens. Chickens add an entirely new dimension to the garden. First, they will make your compost for you. No more turning the compost pile twice a month. When you use the deep-litter method in your chicken run, your chickens will aerate the compost as they scratch and peck for food.

You can throw yard and garden waste, weeds, kitchen scraps, and their bedding into the run and they will mix it all up for you while they look for bugs to eat and add their manure to the mix. If their run ever starts to smell bad, just add a layer of "browns" like straw, shredded leaves, or arborist woodchips, and the smell will disappear completely. Whenever you need compost, you just screen it over a wheelbarrow and add it to your garden.

Your chickens always benefit from having access to a lot of bugs to eat. You get healthy chickens, a place to put all your waste without having to turn a compost pile, and a continuous supply of fresh eggs that taste better than anything you can buy from the grocery store. Plus, chickens can be used in your garden at the end of the season to help clean up weeds, add their fresh manure to the soil, and eat up the pest populations that made their home there over the summer.

USE NATURAL AND ORGANIC PEST CONTROL

For those gardeners who use poisons for pest control, I hate to break it to you but you're doing a lot of damage to the environment. Those poisons may be effective and make your life a little easier, but they are causing a lot of harm.

Some of the main concerns around pesticides include pesticide adsorption to soil particles, volatilisation of pesticides harming nearby vegetation, harming soil life, contaminating surface water and groundwater, and having carcinogenic effects on humans. Why devastate your soil health and put your own health at risk when you can simply use natural and organic pest control methods instead?

The simplest way to tackle some pests is to manually remove them. This is especially true with slugs and caterpillars. For other pests, along with many fungal diseases, neem oil gets results without harming you, the soil, or beneficial insects and pollinators. One application a week for a few weeks should suffice for most issues.

Depending on the pest attacking your garden, there is a wide array of natural methods you can try. These include soap sprays, beneficial nematodes, beneficial predatory insects such as ladybugs and predatory mites, and beneficial microbes such as Bt (*Bacillus thuringiensis*).

Although some companion planting techniques are more folklore than fact, some companion planting techniques are very effective and backed up by science. Planting trap crops, such as nasturtiums, will attract aphids away from the rest of the other plants in your garden. Intercropping garlic throughout your garden will repel many pests.

“You get healthy chickens, a place to put all your waste without having to turn a compost pile, and a continuous supply of fresh eggs.”



With so many natural and organic options, there really isn't a need for toxic pesticides in your garden. And if you still get a few pesky critters chewing on your plants, remember the sage advice that has been passed down to new gardeners for generations: If the bugs aren't eating your plants, then your garden isn't part of the ecosystem.

ATTRACT POLLINATORS TO YOUR GARDEN

It isn't news to anyone that our pollinators are in trouble. Bees are suffering from colony collapse disorder at alarming rates. We need to do our part as gardeners to take care of them because when our pollinators are gone so is our food supply.

You can make an impact simply by planting flowers in your garden to feed the bees. Just one pot of flowers is enough to make a difference, but a variety of flowers blooming throughout the year will let the bees know they can always grab a meal in your garden. Some of the best flowers to plant for your favourite pollinators include borage, bee balm, calendula, nasturtium, lavender, borage, yarrow, and sunflowers. If you give them a mason bee house and a water source, they might just move in and call your garden home.

USE NATURAL, RECYCLED, & UPCYCLED MATERIALS

It's easy to spend too much money on our gardens (is there really such a thing?). Whether it's construction materials, fencing, soil amendments, or garden decor, there is always some new project brewing in a gardener's mind. If you want to save some money and be eco-friendly at the same time, try using natural, recycled, and upcycled materials for your next project.

Logs or large rocks can be used for raised bed borders, and cut limbs and branches used to make trellises.

“By using your creativity, you can save money and take care of the planet at the same time.”



Any number of old items can be used for planters, from old garden boots to rusty wheelbarrows. Broken dishes create beautiful mosaic stepping stones. By using your creativity, you can save money and take care of the planet at the same time.

CONSERVE WATER

The easiest way to conserve water is to collect rainwater. You can put a rain barrel in your garden and water your garden with the water you collect. If you're on city water, then rain water may actually be healthier for your garden than tap water!

Another way to conserve water is to mulch your garden. You'll be amazed at how much less you'll need to water your plants. Mulch protects your soil and prevents it from getting too wet or too dry. This helps the overall health of your plants since many diseases, including blossom end rot and powdery mildew, can be caused by inconsistent moisture levels in the soil. Ideal mulches include arborist woodchips, seedless straw, compost, and shredded leaves.

TRY NO-TILL GARDENING

This may sound like a risky proposition to some gardeners who spend every spring tilling their garden, but hear me out.

When you till your soil, you destroy all the helpful critters and completely disrupt the soil food web. Beneficial microbes, earthworms, nematodes, and mycorrhizal fungi all are essential players in creating rich soil. When you till, you have to rebuild these populations every single year. Over time, your soil health will degrade to the point where you are completely reliant on fertilisers and pesticides to grow a healthy garden.

However, when you stop tilling, and add layers of compost and mulch on top of the soil instead, the soil life will thrive and create a healthier garden than you could possibly imagine. The ecosystem is given a chance to mature. The soil life creates a nutrient recycling system so that fewer inputs are needed over time.

As the years go on, your garden will become like the forest, with an ecosystem that takes care of your garden for you. Just as the forest is self-sufficient, your garden will become much more low maintenance.

These gardening techniques are great ways to grow an eco-friendly garden. By adopting these practises, you can take care of the Earth while she takes care of you. 🌱



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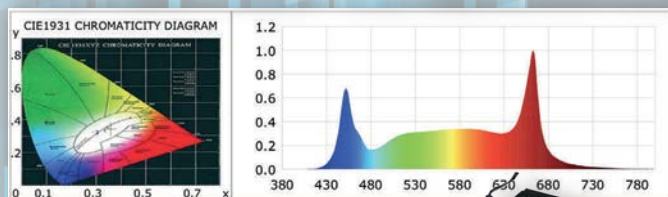
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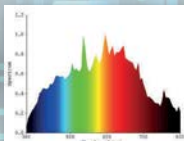
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GROWING COOL-SEASON HYDRO CROPS IN *tropical* CONDITIONS

by Dr. Lynette Morgan

Growing leafy greens under tropical conditions has its challenges, but with some system modifications and careful genetic selection, it is possible to grow productive crops. Lynette Morgan explains how.

Growing cool-season leafy crops under tropical conditions is a challenge faced by many commercial producers as well as smaller-scale growers. Heat and humidity can wreak havoc on sensitive plants, not only from increased pathogen pressure, but with physiological responses ranging from bolting to wilting and overall low productivity. Tropical climates that limit outdoor production of high-quality fancy salad greens, however, can have lucrative local markets for hydroponic produce as well as a growing interest in home food production. The path to success with cool-season crops under tropical conditions involves some understanding of plant physiology and a degree of environmental manipulation that hydroponic methods can provide.



Previous Page: KangKong, or Chinese water spinach is a heat-tolerant crop that is ideal for tropical hydroponic systems. **Left:** Cool-season herbs such as mint benefit from shading and temperature control under warm conditions. **Above:** Cool-season crops such as lettuce can experience growth problems under warm, tropical conditions.

"The path to success with cool-season crops under tropical conditions involves some understanding of plant physiology and a degree of environmental manipulation that hydroponic methods can provide."

GROWING UNDER WARM TEMPERATURES

Tropical climates are characterised by warm to hot day and night temperatures year-round, with very little variation from one month to the next and can experience significant levels of rainfall with constantly high humidity. Light levels are generally high but can drop below light saturation for many leafy crops during periods of heavy rainfall and thunderstorms.

Many cool-season greens such as fancy lettuce have a temperature optimum in the range of 16-22°C with conditions over 28°C increasing the occurrence of germination failures, bolting, tip burn, wilting, lack of colour in red varieties, and low plant weight. High humidity combined with warm conditions also increases disease risk, particularly if foliage becomes wet. When temperatures increase, the rate of plant respiration rises rapidly and the plant may burn up more assimilate that is produced via photosynthesis.

The oxygen requirement in the root zone also increases with temperature, putting pressure on the design and operation of the hydroponic system to provide maximum oxygenation. Root health becomes vital so that sufficient water is taken up and transported out to the foliage to match the rate of transpiration which assists with the cooling the plant surface. A feature of tropical climates is often periods of high humidity, further stressing hydroponic plants as it slows the rate of transpiration, thus reducing the transport of water and minerals, such as calcium, through the plant and out to the leaf tips. Physiological conditions such as tip burn and oedema can become common where transpiration is limited for long periods of time.

While cropping cool-season leafy greens under tropical conditions may seem to have a few difficulties, there are a number of options to make this viable and highly successful.

These include careful selection of species, varieties, and manipulation of both the aerial and root zone environment to allow maximum growth.

Greenhouse growers of leafy greens in tropical climates often use a simple rain cover with insect mesh sides to modify the production environment. This is made more effective by having large top vents that allow warm air to rise and escape from the top of the structure, thus drawing in fresh air from around the sides. Further environmental modification and cooling includes misting systems (when humidity is low enough to allow for evaporative cooling), and air movement fans to help drive transpiration. For salad crops, a shade cloth screen can be set over the roof to reduce incoming solar radiation and lower the stress on the crop.

Many growers in tropical areas experience difficulty germinating seed of cool-season crops such as fancy lettuce or spinach which may go into secondary dormancy when temperatures are too high. This can be managed by having separate germination rooms or using shipping containers under controlled temperatures where seed is germinated for the first 48 to 72 hours before being transferred out into greenhouse nursery areas.



Top: Open-sided structures with shading provide environmental modification in warm tropical climates. **Right:** Mizuna, both red and green varieties, are fast growing and heat tolerant. **Bottom Right:** Bolting, or going to seed is a common problem in lettuce crops grown in tropical climates.

“**Root zone temperatures** play just as much of a role in growth and development as that of the air surrounding the plant.”

For extreme tropical climates, indoor production is often a more viable option, particularly for small, high-value salad greens. This allows more precise control over the environment through use of dehumidification, air conditioning, lighting, and CO₂ enrichment. Small-framed salad greens grown in vertical systems can also maximise space within an indoor production facility and be used on a large commercial scale, or for domestic home units.

ROOT ZONE CONTROL

Whether cool season greens are grown in a greenhouse structure or within an indoor system, control over the nutrient solution temperature is one aspect that can significantly improve yields, quality, and productivity under tropical conditions. Root zone temperature strongly affects shoot growth. In fact, root zone temperatures play just as much of a role in growth and development as that of the air surrounding the plant. This is because the root tissue sends numerous non-hydraulic messages to the shoot which influence the way the shoot

responds to the environment. There is a proven technique that can be used to fool the physiology of cool-season plants into handling higher-than-optimal air temperatures. Root zone chilling of the hydroponic nutrient solution is a technique being used commercially by many growers in warm or tropical climates, most often with cool-season crops such as butter head lettuce, salad greens, and other vegetables. In Singapore, NFT, aeroponic, and deep flow culture systems are utilised with extensive nutrient chilling to grow butter head and Romaine lettuce, crops that otherwise do not grow or yield well at ambient air temperatures. Chilling the nutrient solution down to as low as 16-18°C, allows cool-season vegetables to crop well at ambient air temperatures that are often well above optimal for these crops 28-36°C. Without nutrient chilling, the root zone usually warms to the level of the air and this creates numerous growth problems including slow growth, lack of heart formation, bolting, tip burn, and low marketable yields.



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"A feature of tropical climates

is often periods of high humidity, further stressing hydroponic plants as it slows the rate of transpiration."

Other researchers have reported that nutrient chilling of lettuce also reduces the occurrence of the fungal root disease *Pythium aphanidermatum*. However, trials have shown that while root zone chilling via nutrient cooling can have these effects, the root zone cooling must be applied soon after early crop establishment and maintained for the life of the crop for maximum effect. Just a few minutes a day of root zone temperatures higher than 30°C have been shown to retard the growth of some heat sensitive crops such as lettuce.

TROPICAL HYDROPONIC SYSTEMS

The systems most suited to leafy veg production in the tropics are often those that allow some degree of cooling of the root system, or at least prevent excessive heat build up in the nutrient solution. Studies have shown that deep water culture systems (pond/raft or float systems) give the best results for crops such as lettuce and other salad greens where nutrient chilling is being used. Aeroponics and NFT are other hydroponic systems that are used with nutrient chilling, however, these seem less effective than deep flow systems, possibly because more of the root system is continually submerged in the chilled nutrient in these types of system. Under tropical conditions, the EC in the nutrient solution is run at a lower level than it would be with the same crops under temperate climate production. This helps facilitate the uptake of water and calcium under warmer conditions. Under high light and temperatures, nutrient solutions tend to differ slightly than those run-in systems under cool, winter environments. This includes a higher level of iron and changes in the N:K ratio.

SPECIES AND VARIETY SELECTION

Within the leafy veg category there is a wide range of different plant species and within each species several



Top: Cool-season herbs such as mint benefit from shading and temperature control under warm conditions. Right: Cool-season crops such as lettuce can experience growth problems under warm, tropical conditions.

varieties to select from. Commonly grown hydroponic crops such as fancy lettuce, while all still being cool-season plants, do have some scope with regards to heat tolerance and some increased resistance to production problems such as bolting and tip burn. Commercial seed suppliers often have a variety selections for warmer-season cropping, and while these won't overcome all issues with high temperatures, they are worth evaluating under tropical conditions. Some species of leafy veg are more suited to tropical conditions. These include many of the Asian greens such as mizuna, mibuna, many different types of mustards (that come in a range of leaf shapes, sizes, and colours), Tatsoi, Pak Choy, and Kailaan. As with all leafy greens, if growing under tropical conditions, it is still best to select cultivars suited to the local growing conditions. One tropical leafy vegetable plant that performs extremely well under tropical conditions, and particularly with solution culture hydroponic systems, is Kangkong, also known as Chinese water spinach (*Ipomoea Aquatica*). This semi-aquatic plant is a popular leafy green in many tropical areas and has an extremely high rate of production and yields provided temperatures are kept well above 23°C.



Growing leafy greens under tropical conditions has its challenges, particularly with the cooler-season hydroponic crops such as fancy lettuce. However, with some modification of the system, environment, and careful genetic selection, it is possible to grow productive crops on both a small and large scale. 

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WAYS TO GROW VEGGIES IN YOUR APARTMENT OR TINY HOUSE

by Monica Mansfield

Live in a tiny space but want to grow some of your own food? No problem. There are all kinds of ways to grow healthy food in cramped quarters, and you may even save a few bucks on groceries in the process.



Growing your own food is like printing your own money, and we can all benefit from that right now. Not only will a vegetable garden help you save money on the grocery bill, but the food you grow will be more nutritious and taste so much better.

If you live in a small space, like an apartment or tiny house, you may think you can't grow a garden. However, it's possible to grow at least some of your own food even in a small space. Here are five ways to grow a vegetable garden in an apartment or tiny house.

A SUNNY PATIO

If you are fortunate enough to have a patio with at least six to eight hours of sunshine per day, you can easily grow some veggies in containers. Even a shady patio can be used to grow vegetables such as beets, carrots, and lettuce.

Most vegetables grow well in containers. Ideal crops for containers include tomatoes, potatoes, lettuce, spinach, scallions, zucchini, bush beans, carrots, beets, and herbs. Don't forget to plant a few flowers to attract pollinators!



“Vertical gardening is a great strategy to maximise space in small areas.”

You can use a variety of containers. Plastic pots, cloth pots, and wine barrel planters all work well. You can also reuse any kind of plastic container from the store as long as you drill some drainage holes in the bottom. It's pretty easy to find free pallets, staple landscape fabric on the back of them, and stand them up on their side to lean against the wall and create a vertical garden.

Vertical gardening is a great strategy to maximise space in small areas. You can use trellises in your containers for climbing plants such as pole beans, peas, and cucumbers. Garden towers and pallets are ideal for strawberries, greens, and herbs. Even a utility shelf on your patio can dramatically increase your growing square footage.

YOUR KITCHEN COUNTER

If you don't have any outdoor space for growing, you can always bring your veggies inside. It's easy to mount a small fluorescent light under your kitchen cabinets and grow a few small things on your kitchen counter.



Herbs are ideal for this setup, and it's nice to have easy access to them for cooking. You can also grow a small crop of lettuce or spinach this way. Microgreens and sprouts are quick and easy to grow on your countertop as well.

As with any indoor growing situation, you'll want to make sure the environment is conducive to growing. The temperature should be between 18-24°C and your light should be on a timer. Herbs and greens should get 12-18 hours of light per day and have at least six hours of darkness at night for them to grow at their best.

TOWER GARDENS

Stackable tower gardens can be used to grow plants indoors and outdoors if you're short on space. Their height is flexible, and you can stack them to be any size. They can have 20 or more planting sites in one tower.

Some towers are strictly for soil, while others have a hydroponic design. Some even come with fluorescent lights attached, although those towers tend to be more expensive. If you don't want to use grow lights with them, you can place your tower in front of a south facing window that gets plenty of sun as long as you rotate the tower and make sure all of your plants get light.

You can grow most plants in a tower garden, but strawberries and greens work very well. Towers don't work well for plants like broccoli or cabbage that get very large, or for root crops needing more soil space.

WALL GARDENS

If you don't have counter space, move your indoor vegetable garden to a blank wall. You can install a shelf with a grow light and follow the same light and temperature recommendations as you would need on your countertop.



If your wall garden gets enough light from your windows, you can forego supplemental lighting.

There are also plenty of beautiful wall planters you can find online that will turn your garden into a work of art. Some are made with decorative pots and intricate metal designs. Others are felt hangings with pockets that end up looking like a solid wall of greens once your plants grow. You could have a wall full of salad to pick for dinner every single night!

GROW TENTS AND CLOSETS

Grow tents and closets are ideal for growing veggies because you have more control over your growing environment. You can use lights, fans, and dehumidifiers to keep your temperature around 23°C, your humidity around 50 percent, and your lights on a set schedule.

An empty closet won't take up additional space in your home, but if you don't have an extra closet you can put a grow tent in the corner of a room. They come in sizes as small as 2x4 feet or 4x4 feet.

A wire utility shelf with four or five shelves will maximise your square footage inside of the tent and the wire shelving is easy to hang fluorescent lights on. You can also use containers with a trellis for vining plants, or without a trellis for root crops. If you have a 4x4-foot grow tent, you can put a utility shelf on one side of the tent and containers and trellises on the other side.

Fluorescent lights are sufficient for growing root vegetables, greens, and herbs. However, you will need to invest in some more powerful lights if you want to grow fruiting plants like tomatoes, peppers, cucumbers, or watermelon. Metal halide and high-pressure sodium lights will allow you to grow a wider variety of crops, however, they will increase the heat in such a small space and may require more fans to cool the environment.

As you can see, even if you live in a small space you still have options for growing some of your own food. Whether it's a couple of pots on your patio, kitchen counter, or living room wall, your wallet and taste buds will thank you. **NY**



a brief HISTORY OF OLIVES

by Philip McIntosh

Popular as hors d'oeuvres or plunked into a martini in modern society, olives are steeped in mythological lore and have been cultivated for longer than you might think.



In a contest with Poseidon, God of the Sea, to gain favor with the people of Athens, Athena, the Goddess of Wisdom, thrust her spear into the ground near the Acropolis and there planted an olive branch that quickly grew to be the very first olive tree. Since Poseidon's gift to the people was a saltwater spring, it wasn't even close. It would be a challenge to find a tree more steeped in culture and myth than the olive, or, as it was known to the ancient Greeks the "moria."

Although fossil evidence indicates an origin for the olive dating to millions of years ago, possibly in the eastern Mediterranean region, it has coexisted with humans for many thousands of years with cultivation underway as long ago as 6,000 BCE. Although not native to other parts of the world, due to its hardiness, the olive has found a foothold in places as far flung as South America, California, and Japan. Italy and Spain are the world's biggest olive producers today, with Greece coming in a respectable third. Olive trees adapt well to difficult conditions, and do not require much in the way of care, as is befitting a tree with such a generally squat and gnarled appearance. When it comes to longevity, olive trees rival the world's oldest, with some stands in existence for at least 2,000 years.

All parts of the olive, *Olea europaea* (L.), are useful. Of course, there is the fruit, which is technically a drupe, commonly known as a stone fruit, which contains a single seed. Extremely bitter when raw due to a high concentration of the phenolic compound oleuropein, olives must be processed to render them edible, most commonly by pickling in brine.

Olives are well known for their oil, for which most olives are grown. Olive oil was made in ancient times

by first cleaning the fruit, followed by crushing and pitting, and then pressing or beating the pulp in bags. Rinsing and several rounds of settling and separation completed the process. Early Mediterranean engineers devised a number of machines to increase the force applied during pressing to increase efficiency. Various permanently constructed pressing, decanting, and storage structures are known from the archeological record indicating olives were big business from early on. The production of olive oil today follows essentially the same sequence that was used thousands of years ago but centrifugation is often used instead of a more traditional pressing method.

Olives hold a special place in history, and not only as a food. Some of the earliest uses of olives and olive oil were as an anointment in religious ceremonies, as a fuel, and, of course, for cooking. In addition to being edible as a food, olive leaves are used to make medicinal teas and the wood is much admired by woodworkers.

A byproduct of olive oil production is a nasty-smelling and environmentally unfriendly substance called amurca. Amurca is the watery residue left after the quality oil has been separated. In Roman times it found use as a kind of shellac, a lubricant, an animal feed, a dressing for wounds, fertiliser, sealant and, due to its high phenolic content, a moth repellent.

The olive has made, and continues to make, its mark in religion, medicine, myth, and legend. Is the olive growing west of the Parthenon today a descendant of the legendary tree struck into the ground by the Goddess Athena? One can imagine it to be true. **NY**

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10 facts on BEETS

by Philip McIntosh

Sweet or earthy in flavour; love them or hate them – enter the beet, which has been cultivated for thousands of years.



- 1 **The beet**, known as *Beta vulgaris*, likely originated in southern Europe's Mediterranean region, where it has been grown and bred since the time of the Ancient Egyptians.
- 2 **The genus name** *Beta* is Latin for "beet," and the oft-seen specific epithet *vulgaris* means "common."
- 3 **Beets are** red, right? Hold on. Sugar beets look more like a turnip with white flesh and a conical, rather than spherical, tap root. Other beets are yellow or orange.
- 4 **Red pigments** in plants are often classified as anthocyanins; not so in the beet. Beet roots contain the deep-red pigment betalain.
- 5 **Betalain is** under investigation as a possible anti-cancer agent, as is beet juice for the treatment of high blood pressure.
- 6 **Beets are** good sources of fibre, carbohydrates (fructose), antioxidants, minerals, and vitamins.
- 7 **Sugar beets can** have up to 20 percent fructose in the root while the red varieties can have up to six percent.
- 8 **What's the difference** between cane sugar and beet sugar? Absolutely nothing — they are identical.
- 9 **When people think** of genetically modified crops (genetically modified organisms — GMOs) they often think of corn or soybeans. Add sugar beets to the list. More than 95 percent of all sugar beets grown in the U.S. are genetically modified.
- 10 **What about** "table" beets, the red kind you stew, roast, or pickle? As of right now, there are no GMO red beets on the market.

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See the results of our products first hand on youtube: