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“

Whether a newbie grower or a soil grower transitioning to hydroponics, now you have the basic automation knowledge and checklist to build out your growroom for success.”

MAXIMUM YIELD

Features

30 Automation Must-Haves for New Growers

by Keith Bouchard

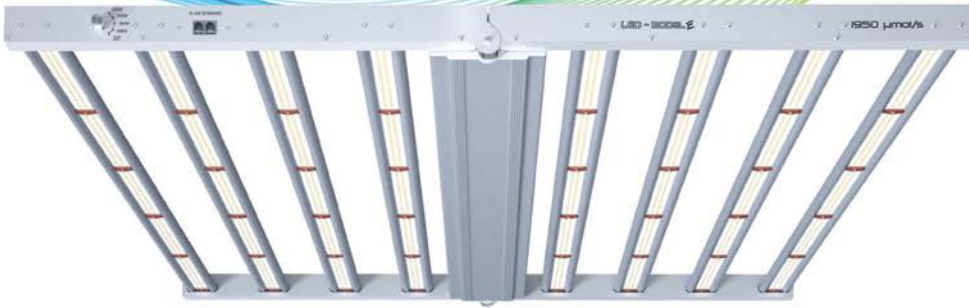
Being in control of your indoor garden can seem intimidating at first, but with the right automation and knowledge, your plants will think Mother Nature is running the show.

34 The Healing Powers of Gardens

by Alan Ray

During the COVID-19 pandemic, tens of thousands of people turned to gardening to help them cope. These gardens helped people stay fit, positive, and nourished. Alan Ray digs a little deeper into the psychology of gardening.

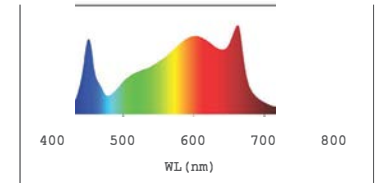
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- Total Amps: 1.25 A

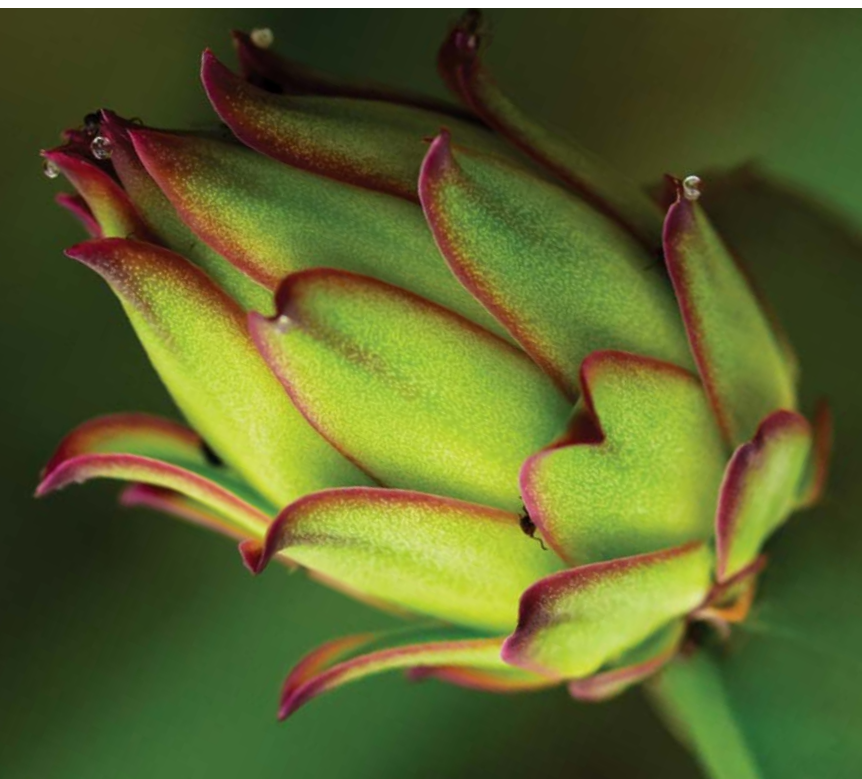
500 W UFO LED

- Total PPF 1050 $\mu\text{mol/s}$
- 2.1 $\mu\text{mol/J}$
- Samsung & Optimum Diodes
- Full Spectrum - CRI 90
- Optimum Driver
- 450 mm $\varnothing$ - 230 mm H
- Total Amps: 2.1 A



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MAXIMUM YIELD

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“
The time spent in the garden over the summer really is the real magic. Anticipation, learning, and even some worries all crescendo into the imminent harvest.

from the EDITOR

TG Toby Gorman

Throughout the summer of COVID-19 in the Northern Hemisphere, gardening served as one of the top activities for people. It provided an opportunity to get outside, get some fresh air, be active, and focus on a task that would result in healthy rewards and benefits. Now, it's Australia and New Zealand's time to get back to the garden.

As COVID lingers and prevents us from participating in the many activities that allow us to interact, gardening will play an important role in keeping many people active, outside, focused, and connected in the months ahead.

As stated in Alan Ray's article "The Healing Power of Gardens" on page 34, gardens can provide an ample amount of both physical and mental health.

"While working in a garden, secret rewards are slowly revealed to us between the sowing and the reaping, two acts that simply designate a beginning and an end. The time spent between those events is where another magic happens," writes Ray.

Now is a good time to revisit that neglected patch of garden in your yard. Start by pulling some weeds, then planting herbs, fruits, or vegetables that will do well in your zone. There are many online resources to guide you, or visit your local garden shop.

The time spent in the garden over the summer really is the real magic. Anticipation, learning, and even some worries all crescendo into the imminent harvest.

Hopefully by then, COVID will have passed and the world can focus on moving forward in a way more in tune with nature. 

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Featured Contributors

KB Keith Bouchard is the founder and co-inventor of Multiponics, an indoor gardening manufacturer and online boutique. He has a passion for pushing innovative ag-tech forward and is a consultant to the NASA-funded X-Hab project at the University of Colorado in Boulder.

AR Alan Ray has written five books and is a *New York Times* best-selling author. Additionally, he is an award-winning songwriter with awards from BMI and ASCAP respectively. He lives in rural Tennessee with his wife, teenage son and two dogs: a Boerboel (south African Mastiff) and a Pomeranian/Frankenstein mix.

Contributors

+ **Kent Gruetzmacher**
Monica Mansfield
Phil McIntosh
Dr. Lynette Morgan
Kate Van Druff



A MACRONUTRIENTS



Essential **macronutrients** are the primary nutrients that plants use in large amounts to grow and produce. Each macronutrient plays a unique and essential role in promoting plant growth, vigour, and flowering. A shortage in any of them leads to adverse effects. Plants are comprised of 60 chemical elements, 16 of which are essential. Carbon, hydrogen, and oxygen are extracted from the air. The remaining 13 are extracted from the soil. Six of these can be considered essential macronutrients for plant growth:

Nitrogen – plays a fundamental role in energy metabolism and protein synthesis. It is absorbed by the plant in the form of a nitrate and is directly related to plant growth. It is indispensable for photosynthesis activity and chlorophyll formation.

Phosphorus – transports and stores energy for growth, flowering, and seed formation.

Potassium – regulates water and the transport of the plant's reserve substances. It increases photosynthesis capacity, strengthens cell tissue, and activates the absorption of nitrates. Potassium stimulates flowering and the synthesis of carbohydrates and enzymes.

Calcium – necessary for respiration, cell division, and cell stabilisation. Calcium contributes to mineral retention in the soil and to the transportation of such minerals.

Magnesium – constitutes the core of the chlorophyll molecule and is therefore essential for photosynthesis. Magnesium promotes the absorption and transportation of phosphorus and iron. It contributes to the storage of sugars within the plant. Magnesium performs the function of an enzyme activator and activates more enzymes than any other nutrient.

Sulfur – It is necessary for performing photosynthesis and intervenes in both protein synthesis and tissue formation. Sulfur is fundamental in the metabolising of nitrogen.

Check out Kathryn M. Van Druff's article on page 48 for more information.

MAXIMUM YIELD

AUS/NZ EDITION • VOL.18 NO.5
September/October 2020

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Publication Agreement Number 40739092
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“Will flushing the hydroponic nutrient solution improve the taste of my tomatoes? If so, when is the best time to flush?”

Absolutely it will. It will cause the plant to cannibalize itself eating stored nutrients in its leaves and removing built up nutrients in the soils or medium. Starting the ripening process can only be achieved from flushing the plant with plain water.
1 - 2 weeks is generally the timeline for flushing.
— @4treesbuilding

Maybe if you're doing determinate plants. But determinate in hydro commercially is not logical. Home grower that's fine 🍌🍌
— @friendly_neighborhood_farmer



James G.

Very good article. I found my closed RDWC system far more wasteful than I was expecting too. In a 15 gallon capacity system 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 & the plants then creating carbonic acid as a response?



@thetunafarmer

MaxYield has always been an informative source, used by many growers' to build up their knowledge base. Keep doing what you do @maximumyield and Happy Canada day to you all!



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DO YOU HAVE A QUESTION FOR A GROWER? Email editor@maximumyield.com to get an answer.

ask a GROWER

by Monica Mansfield



I'm growing leafy greens in my hydro system in my basement. What is the ideal humidity level and what is the best way to control it? Thanks.

– Preston C.



Thank you for your question. The ideal relative humidity for growing leafy greens is 50-70 percent. To prevent mold and mildew from becoming an issue in your basement, home experts recommend keeping your basement between 50-60 percent.

It is crucial to maintain the proper humidity when growing leafy greens. High humidity levels can cause powdery mildew and tip burn. When humidity is too high, it causes transpiration to occur more slowly, which in turn slows the absorption of calcium. This calcium deficiency causes tip burn.

Low humidity can cause outer leaf edge burn. This is a physiological disorder where lesions develop on the veins on the outer edge of the leaves. It is caused when sap exudes from the veins and then reabsorbs, creating a salt buildup.

It is also important to keep your humidity level consistent. Rapid changes in humidity can stress your plants and cause tissue damage because the plant doesn't have time to adjust to changes in the environment. Rapid changes usually happen when you flood the room with dry outdoor air or from a sudden change in temperature.

When controlling humidity, keep a few key points in mind. Cooler temperatures increase humidity, while warmer temperatures decrease humidity.

The water from your hydro system may increase humidity through evaporation, depending on the type of system you're using. The more plants you have, the higher your humidity levels will be due to transpiration. If you are exchanging your air, the humidity level of the outdoor air you are bringing in will influence your indoor humidity level.

A dehumidifier is going to be the best piece of equipment to control humidity. Most dehumidifiers can be set to maintain your humidity at the level you choose. Keep in mind a dehumidifier will create heat in your room. While this may be good for burning off excess moisture, the heat from all your grow equipment can generate too much heat, in which case you'll need to find a way to lower the temperature in your growroom. You can do this by exchanging indoor and outdoor air with exhaust fans, or by adding an air conditioner to your room. If you exchange your air, be mindful of the temperature and humidity outdoors, and how that may affect your indoor environment. These factors are constantly changing, and you'll need to make adjustments regularly to balance them so your humidity remains consistent. 🍷

*Good luck and keep growing!
Monica Mansfield*



Monica Mansfield owned an indoor garden store for 5½ years before selling the business to start a seven-acre homestead with her husband, Owen. Monica is passionate about gardening, sustainable living, and holistic health. She writes about these topics and her homestead adventures on her blog, thenaturelifeproject.com.

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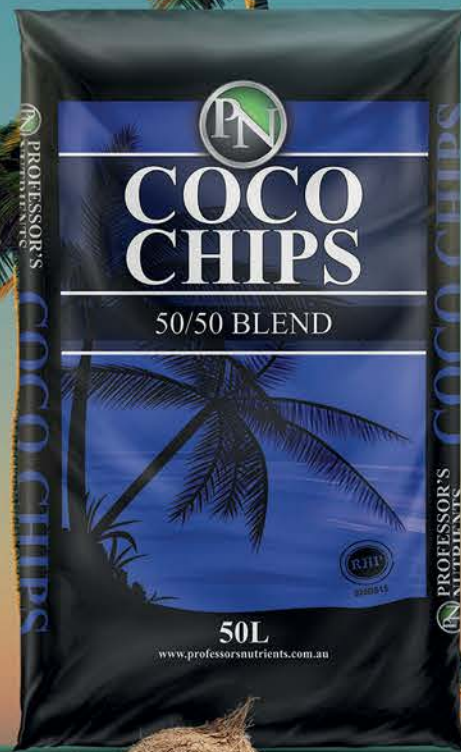
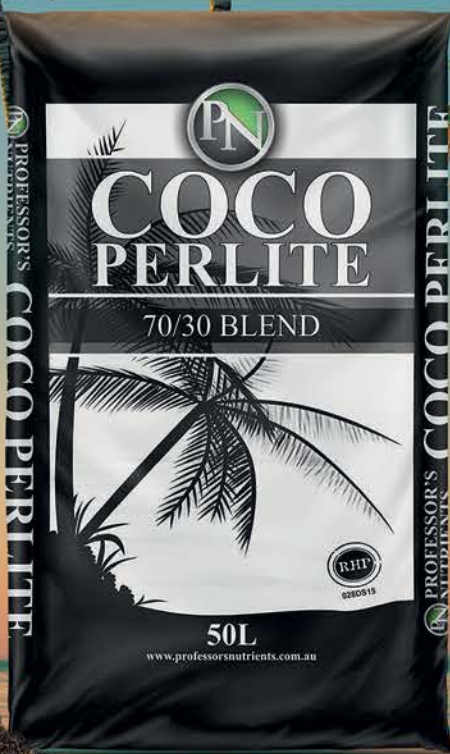
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Woman Terrified by Potatoes after Return from Lockdown

Having been gone from her home in Caen, France for three months to spend mandatory lockdown with her boyfriend, Donna Porée, 22, returned home in June to find a frightening scene growing in her kitchen. Turns out, she had nothing to be afraid of, though the sight of three-foot potato sprouts growing through her shelves and up the walls gave her a fright when she turned the lights on. "As I opened the front door, I noticed a strange shape at the back of the kitchen," she told *The Sun*. "As the light was off and shutters down, I didn't realise it was the potatoes. It was only after opening the shutters that I took note of this extraordinary sight. I was terrified at first, but after realising what it was, I laughed a lot." Porée had left a \$3 bag of potatoes under the shelves when she left, not thinking she would return to such a sight.

– [thesun.co.uk](https://www.thesun.co.uk)



Five Cleanest Fruits and Vegetables

The Environmental Working Group recently published its ranking of the fruits and vegetables that are lowest in pesticide residues, primarily based on USDA testing. To develop the list, the EWG reviews 48 common, non-organic fruits and vegetables, including US-grown and imported items. Topping the list is avocado after the USDA tested 360 avocados and found fewer than one percent had pesticide residues. Tests were done after the skin is peeled, so most pesticides in avocados are removed with the skin. Coming in at No. 2 is sweet corn, but keep in mind the ranking does not include glyphosate (Roundup) residue that some corn has been modified to resist. The FDA has only recently started testing corn for glyphosate residues. Third on the list is pineapple, another fruit that is consumed after the pesticide-containing skin is removed. Onions are fourth after pesticide residues were found on less than 10 percent of those sampled. Rounding out the top five is the humble papaya.

– [healthline.com](https://www.healthline.com)



Sri Lankan Coir Industry Thrives Despite Pandemic

Due to the growing popularity of coco substrates and the quality of Sri Lankan coco products, the industry has seen rapid growth that was hampered by the COVID pandemic. The effects of the lockdown were big, both for the horticultural supply chain and for the 20,000 people working in the direct coco husk supply chain, as well as another 100,000 indirect jobs in Sri Lanka. However, due to the timely intervention of ECAS (Exporter Association of Coconut husk-based substrates), the industry was running again within less than two weeks, although production capacities remained lower due to social distancing and other guidelines. Established in 2008, ECAS is responsible for almost 95 percent of the coconut husk-based total exports from Sri Lanka. With these amounts, they are also responsible for more than 120,000 employment opportunities in the supply chain, positioning the industry among the top 10 of foreign exchange earners for Sri Lanka.

– [hortdaily.com](https://www.hortdaily.com)





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max FACTS

Mycorrhizal Fungi Enhance Cherry Tomato Growth

Arbuscular mycorrhizal fungi (AMF) are a promising tool to improve plant nutrient use efficiency (NUE) and tolerance against abiotic stresses. Moreover, AMF can potentially increase plant productivity and reduce the negative externalities of the agricultural sector. A recent study aimed to see if AMF could positively affect not only tomato growth and productivity, but also the nutritional and nutraceutical quality of yellow-pigmented type and red-pigmented type landrace tomatoes. Turns out AMF rose fruit yield by increasing the number of fruits per plant but not of the fruit mean mass. AMF increased lycopene, total ascorbic acid, alanine, gamma-Aminobutyric acid, and branched-chain amino acids in 'Lucariello' varieties. In 'Giagiù', AMF increased calcium, zinc, ASP, GABA, and the essential amino acids arginine and lysine. In both landrace varieties, AMF improved nutrient uptake and biosynthesis of important molecules involved in the control the oxidative stress and cellular pH.

– freshplaza.com



Sea Vegetables: An Important New Source of Nutrition?

According to aquaculture experts in Florida, sea vegetables could provide a tasty source of nutrition in the future. The native Florida vegetables that grow in salty areas near the ocean can be cultivated in fish farms; crops like these could provide a new sustainable and environmentally friendly source of nutrition. Megan Davis, professor of aquaculture at Harbor Branch Oceanographic Institute in Fort Pierce, recently led a 10-week study to determine the best growing conditions for sea vegetables. Plants in the study were sea asparagus (which looks almost like regular asparagus), sea purslane (harvested for the fleshy leaves on long red stems), and saltwort, a smaller frilly plant. The plants are high in minerals, such as zinc and iodine, and vitamins, but Davis notes she is awaiting a detailed nutrition analysis from the harvest. Besides Florida, sea vegetables are native to other coastal regions around the world.

– gephardtdaily.com



Turning School Buses into Greenhouses

A Canadian woman and her family came up with a perfect solution for repurposing old school buses, and it's benefiting both the environment and the pocketbook. Doni Rae Franklin and her family have managed to upcycle two yellow buses into greenhouses: a longer one that is stationary, and a shorter bus that's still mobile so the family can drive their fresh produce to market. The roof on the longer bus, which was replaced with polyethylene plastic, creates the ideal environment for growing crops and plants. The family put the tin roof from the longer bus to good use by making planters to grow crops in. The shorter bus, with its original roof still on, is great for keeping frost off growing crops. "As I've been getting more and more into commercial gardening, I've realised that these greenhouses are the best way to achieve a reliable harvest, stopping things like frost and hail from taking a toll," says Franklin.

– aleteia.org





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1 | FloraMax Clone Spray

FloraMax Clone Spray is a foliar spray that improves strike rate and rooting speed, while promoting vegetative growth in clones and seeds. Extremely safe and easy to use, Clone Spray also contains a wetting agent that aids in nutrient uptake and absorption. Fast becoming the choice of numerous commercial cloneries, users report “personal best” levels of performance and drama-free transitions into subsequent phases of growth. Clone Spray contains no plant growth regulators and will not burn your leaves.

2 | Pro Grow UFO LED 300W

The new Pro Grow (available in 300 and 500W configurations) UFO LED blends quality SMD diodes from both Samsung (blue) and OSRAM (red) with an efficacy of more than 2.1 $\mu\text{mol}/\text{J}$. Pro Grow UFO LED's emit 4,000 Kelvin full-spectrum light with an industry leading CRI of 91.8. Coupled with ultra-reliable Optimum drivers, the lightweight and durable die-cast aluminium housings offer cool, fanless, and silent operation. Extended reliability is assured with IP-55 water resistant, cleanable housings. These LEDs are available at Growhard.

3 | Cyco Platinum Series Zyme

Cyco Platinum Series Zyme is an enzyme-based additive used throughout the vegetative and flowering periods of plant growth to aid in breaking down organic matter. Zyme breaks down organic matter into usable components, while also breaking down and cleaning sources of decay, and converting complex polysaccharides into simple sugars that are available for the plant's immediate benefit. Cyco Zyme also contains trace amounts of the nitrogen, phosphorus, and potassium – the macronutrients needed for photosynthesis, plant growth, and development.

4 | Ozi Magic Bud Swell

Bud Swell is a diverse blend of soluble seaweed, beeswax extract, vitamins, and plant extracts, combined with selected high-quality mineral salts. Bud Swell is the perfect plant booster for organic growers, boosting the plant's ability to promote the building blocks for maximum plant growth. Bud Swell is the latest formula upgrade from Ozi Magic's research team, combining high-quality essential metabolites with soluble organic plant extract and pure mountain spring water. Bud Swell is perfect to use with organic mediums, coco fibre, and organic soil blends.



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5 | Pro Grow Model E 680 W – 8 Bar

The new Pro Grow LED 680 W – 8 Bar has an industry leading output of 1,950 $\mu\text{mol/s}$. Pro Grow blends Samsung white 301H and OSRAM 660 nm hyper red top bin SMD diodes for an outstanding efficacy of over 2.85 $\mu\text{mol/J}$. It emits 4,000K full-spectrum light with a CRI of 91.8. The lightweight and durable die-cast aluminium housings offer cool, fanless, and silent operation. Fixtures are dimmable via the dial on the array. Look for it at Growhard Australia.

6 | Bio Diesel Supernatural

Supernatural is a new, premium organic root and shoot stimulant made from a blend of organic sea algae extracts and Bio Diesel's famous bio stimulants. Supernatural (0-1-1) will help your plants create massive lateral feeder roots and increase nutrient uptake with an immediate plant response. Supernatural, which is compatible with all nutrient programs, is ideal for correcting plant stress and trace element deficiency and can be used in soil, hydroponics, coco fibre, clay balls, or any inert hydroponic media.

7 | Hanna Instruments pH Dosing System

All hydroponic growers know how important maintaining a balanced pH is for successfully growing plants. The new HI981412 pH Dosing System from Hanna Instruments is engineered for maintaining the pH of nutrient solutions and irrigation water. This dosing system was developed to be an inexpensive solution for the horticulturist to maintain the ideal pH. Simply insert the probe and injection valve in-line with the recirculation pump and provide the chemical to be dosed.

8 | FloraMax Roots-XS

FloraMax's Roots-XS is a leading-edge root accelerant that promotes super-healthy vegetative growth and explosive root mass. Growers report stall-free and drama-free transitions through all phases of growth allowing you to get ahead of the curve when transplanting and pruning. Roots-XS runs extremely clean and won't clog drippers, foam up in the reservoir nor create foul odours or biofilms. Furthermore, this organic hybrid additive will not affect the working nutrient pH in the reservoir.

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AUTOMATION **MUST-HAVES** FOR NEW GROWERS

by Keith Bouchard

Being in control of your indoor garden can seem intimidating at first, but with the right automation and knowledge, your plants will think Mother Nature is running the show.

Hydro newbies, don't be scared, just get growing! Hydroponic gardening is not that intimidating, just choose your own way of going about it. This article will provide beginners with automation basics in order to get automated using any hydroponic growing method, regardless of current knowledge or skill level.

Identifying Priorities

Lighting and temperature control are probably the most important factors in growroom automation. In fact, these are the two main aspects that need to be controlled in any cultivation operation. Whether growing in a greenhouse, indoor garden, or other type of controlled environment, lighting and temperature are usually the most important parameters, humidity being a close third. Controlling these three are the main factors in producing a high-quality crop and maximum yield. This article explores ways to use basic automation to help.

Lighting Timers

For budding and flowering, many plant species depend on photoperiod rather than general age, lifecycle, or seasonal temperatures. Photoperiod simply means the amount of daylight hours versus dark hours in a 24-hour period. By controlling the photoperiod, we are simply telling the garden which season it is. In summer, days are longer while in winter nights are longer. The grow lights need to be programmed as such, and the easiest way to do this is with a heavy-duty timer. Buy lighting timers from a grow store to ensure the proper amperage rating to prevent overload to your electrical system. Most plants grow vigorously in early summer, bud in late summer, and fruit in the fall. Typical settings used to mimic seasons are 18 hours "on" for vegetative growth, as in spring/summer, and 12 hours (or less) "on" for budding fruits or flowers, as in fall/winter.

Irrigation Timers

A timer may also be needed for your hydroponic or aeroponic pump to automate irrigation and keep the plants fed and oxygenated. Since pumps do not have a high electrical demand like grow lights do, heavy-duty timers with high amperage ratings are not usually needed. Timers sold by most grow stores are suitable for lights and pumps.

Simple timers can automate most irrigation setups and smart timers allow for remote control via Wi-Fi apps and various programming options. Attach timers to pumps to automate nearly any type of hydroponics or aeroponics irrigation setup.

Temperature Control

With hydroponics, water temperature is a key factor. If the water gets too hot, roots harbour pathogens and rot. With an open reservoir that is allowed to evaporate, water will stay about 5°C cooler than the ambient room temperature.

Thermostat Controller

Temperature control will allow you to manipulate the environment your plants are growing in. This allows for cultivation of a variety of crops, depending on their given needs. For example, tomatoes do not consistently flower or fruit without temperatures above 21°C.

This can be tough to do in winter without a heater and some sort of thermostat control to automate temperature. On the other hand, some varieties are not very heat tolerant, so thermostats or timers are often used with fans to remove heat from the garden. Thermostats can automatically maintain a set temperature. Some thermostat controllers have separate day and night settings as well.

Fans

Often, a simple exhaust fan with a passive intake is the most effective way to remove heat from the growroom. Hydroponic shops sell can-style fans that connect ducting to light fixtures, also known as reflectors, and remove the heat produced by the intense grow lights. Besides using thermostat controllers, fans are often controlled with timers set to run when the lights are running. This setting will remove heat during the day and preserve heat at night.

Automation Hydro Growers Should Consider

Temperature control is vitally important and often challenging. A simple window air conditioning unit will do wonders in an indoor grow environment but keep in mind this will also remove humidity. This is usually a desired effect in growrooms because the transpiration of the plants as they vigorously grow puts lots of humidity into the air, which usually needs to be removed. An AC unit will do a good job of this. HVAC units will also automate heat control by simply setting a thermostat.

Humidity

Growroom automation makes hydroponic production more efficient and allows for production at a faster rate. Start with dialling in automation of your growroom temperature and photoperiod, then consider additional automation such as irrigation, nutrient dosing and humidity.

Humidity control will allow your plants to thrive in a given temperature. Plants will grow faster, bigger, and stronger if their environment is balanced at a desirable temperature and humidity level. The plants can then drink water and nutrients and allow for photosynthesis to occur at a more rapid rate. The excess humidity must be removed for the plants to continue growing at this level of hyper-efficiency.

**"BY CONTROLLING
THE PHOTOPERIOD,
we are simply telling the
garden which season it is."**

“TEMPERATURE CONTROL
will allow you to manipulate the environment your plants are growing in.”

Hygrometer Controllers

As described before, AC units offer humidity reduction by default, but how do you control humidity levels independently? Like AC units, fans also remove humidity. After automating temperature and lighting, automation of humidity is an upgrade that makes a lot of sense. A hygrometer controller is an easy way to automate humidity control to a specified relative humidity, represented by a percentage setting. A good target is somewhere between 30-60 percent, depending on the species of plants being grown. Be careful not to allow humidity to remain above 60 percent for extended periods of time in order to prevent molds. If this is a concern, you can always utilise additional circulation or oscillating fans.

Growroom Controllers

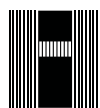
Control your whole room with a comprehensive controller that regulates lighting, temperature, humidity, CO₂ levels, and more. Many controllers have easy-to-use apps, putting automated remote control of your growroom at your fingertips.

Nutrient Dosers

Heading towards full automation, many hydro growers choose to integrate nutrient-dosing technology into their irrigation system. Simply prepare nutrients separately and set the doser to maintain a certain EC/ppm level, then the nutrient doser will do the mixing for you. Set your reservoir on a float valve to experience complete fertigation automation. All you need to do at this point is periodic system cleaning and maintenance, and just be sure to top off the nutrient containers on the dosing system.

Whether a newbie grower or a soil grower transitioning to hydroponics, now you have the basic automation knowledge and checklist to build out your growroom for success. Start with lighting and temperature and then add more automation in order to further dial in your environment as you grow into your garden. This is an easy way to expand your production capacity and maximise the potential of your hydroponics garden. 🌱

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The Healing Power of Gardens

by Alan Ray

During the COVID-19 pandemic, tens of thousands of people around the globe have turned to gardening to help them cope. These gardens help people stay fit, positive, and nourished. Longtime gardener and MY contributor Alan Ray wanted to dig a little deeper into the psychology of gardening, so he tapped wellness expert Seth J. Gillihan for some answers.

Throughout time, gardens have held a special place for us. The legendary Hanging Gardens of Babylon are considered one of the Seven Wonders of the Ancient World, Adam and Eve honeymooned in a garden, and the stunning 100-year-old Butchart Gardens on Vancouver Island is still regarded as one of the most beautiful in the world. Gardens have a trifecta effect on us. They can touch us physically, mentally, and spiritually. They can even help heal us.

A CORNUCOPIA OF GOOD THINGS

Just being outdoors again after a long, cold winter is good for the body, mind, and soul with its warm, vitamin D-infused sunshine and the sweet songs of happy little birds — uplifting. But by the time spring returns, the body could use a little exercise to work out the stiffness and loosen up those winterised muscles. Working in a garden is an excellent way to do that.



On a deeper level, our mind and spirit experience a makeover, too, as the doldrums of winter are replaced with the joy of envisioning, creating, and executing our garden plans. All these activities lend themselves to a feeling of purpose and well-being. Let's explore what other seeds a garden can sow within us.

GARDEN MAGIC

The garden harvest marks the happy culmination of the fruits of your labour. The final act before the curtain drops on the growing season. But as gardeners across the world know, a garden yields so much more than merely a magical harvest. While working in a garden, secret rewards are slowly revealed to us between the sowing and the reaping, two acts that simply designate a beginning and an end. The time spent between those events is where another magic happens.

Admittedly, the first couple days of garden prepping can be a little rough on the body. Those sleepy muscles of winter don't always want to wake up too quickly, but always do. A few days of bending, squatting, and digging, and that stiffness is replaced with a more fluid movement. Which segues nicely to the point of this article — the physical, mental, and spiritual benefits that manifest themselves through gardening. It's rather cosmic stuff and proven to be true. Let's start with the physical perks. I'm sure your own experience will verify what I say is true.

“
While working in a garden, secret rewards are slowly revealed to us between the sowing and the reaping, two acts that simply designate a beginning and an end.”

FULL-BODY WORKOUT

Gardening is like a full-body workout. At first, muscles you forgot were there start aching. But then, it gets better. Carrying bags of soil strengthens our back, arms, and legs. Digging, hoeing, and raking tightens our core muscles and gives the shoulders and hands a good workout. Rolling a wheelbarrow, pulling a mulch-laden wagon, or even lifting potted plants increases muscle strength in our arms and lower back. All these activities increase stamina, improve our cardiovascular system, strengthen our overall physique, and render us happily tired at the end of the day.

Popping a good sweat while soaking up some sunshine makes your body feel better and you feel better about your body. Physically working in the garden also helps to relieve stress and allows us to decompress naturally.

THE DOCTOR IS IN

The physical values of gardening are obvious but for the mental and spiritual dimensions, we're going to have to dig a little deeper.

To learn about those qualities, I reached out to wellness guru Seth J. Gillihan, PhD., author, international lecturer, and Assistant Professor of Psychology at the University of Pennsylvania, who specialises in mental and spiritual wellness. I tracked him down after reading an article he penned in *Psychology Today* about how a garden mirrors life and can teach us, and even heal us, in indefinable ways.

The good doctor was gracious enough to answer a few questions about the unexpected and salubrious side effects of gardening. I was to learn how gardening played an indispensable role in helping him heal from a difficult and lingering illness.



What are some clinically proven benefits for the mind that arise from gardening?

Gardening is really a mind-body-spirit activity. Being outdoors has well-known effects on mood, and physical activity is good for all kinds of things, like lowering anxiety and improving sleep. It's also a great way to get out of our heads and the constant stories we tell ourselves that contribute to worry and rumination and focus our awareness on all the stimuli in the garden.

How much time can one spend in a garden before beginning to feel better?

It can really start from the moment we step into the garden. Just the act of entering the garden can start to quiet the nervous system, putting us into parasympathetic activity which turns down the stress response. Personally, I benefit at times just from looking out my second-floor window at the garden below, and feel my breath deepen and my shoulders relax.

“Digging, hoeing, and raking tightens our core muscles and gives the shoulders and hands a good workout.”

Do the good feelings remain when the gardening season ends? Winter can be a time for depressive feelings.

Winter can be a challenging time as we put the garden to bed and say goodbye to all the green and the productivity. But it's also a good reminder of the seasons that all of us pass through, and that life follows death. Life, in fact, is built on death, if we think of the decay of compost piles and the magic that compost works in our garden beds. So, gardens can remind us that it's normal to experience cycles and ups and downs.

How did gardening help you through your challenging illness? And did the beneficial effects last?

I was dealing with a lot of bewildering symptoms that eventually led to a pretty deep depression, and I knew I needed to get more engaged in activities I enjoyed. So, I built a fairly extensive backyard garden. It really helped bring me back to life — constructing the wooden beds, learning about starting seedlings, planning the layout of the garden. I never felt more content than when I was gardening, and it gave me a great reason to spend hours outside every day. I'm still feeling those beneficial effects, now in the second year of this garden. Gardens are also great for connecting with other people, like when we shared spring kale with friends during the pandemic because they were having a hard time finding green vegetables their young kids would eat. The kids loved the kale leaves roasted with olive oil into kale chips.

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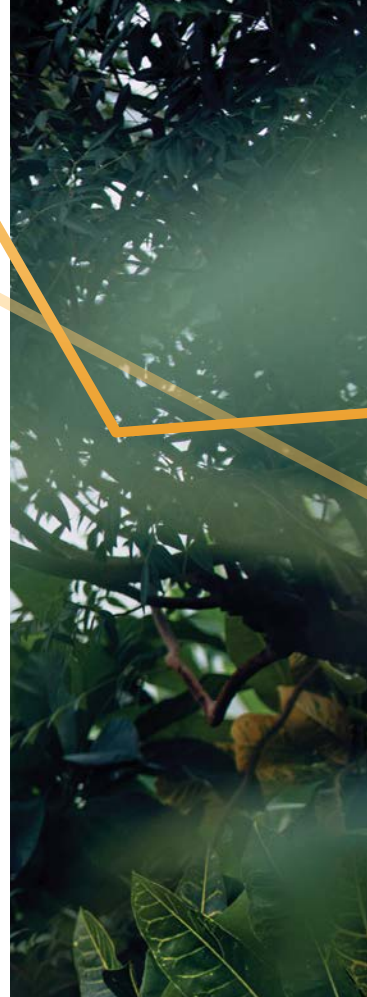


THE LAST WORD

Gardens are indeed magical places that bring forth life, support life, and give back to us in mysterious, yet, tangible ways. They improve the way we connect with life and, by proxy, each other. In addition to its bounty, a garden, with its natural beauty, can heal, inspire, uplift, and stir our emotions. So much so, philosopher and author Khalil Gibran (*The Prophet*) was compelled to write, "Sadness is a wall between two gardens."

When we truly connect with our garden, regardless of its dimensions or type, seeds are planted within us that take root, grow, and yield a world of healthy dividends. So much so, I am compelled to write, "Gardens... I dig 'em." Not as poetic as Gibran, but a nice double entendre. ^{NY}

“
I was to learn how gardening played an indispensable role in helping him heal from a difficult and lingering illness.”





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One of the more well-known nutrient companies in Australia, Ozi Magic has been helping growers maximise their yields for almost 20 years, but their experience in the hydroponic industry goes far beyond that. Steve Crain talks about Ozi Magic's history and successes.





“

From those early years in the 90s, our business shifted from equipment and fertilisers to just focusing on manufacturing the best fertilisers that years of hands-on research could produce.”

How did you become involved in the hydroponic Industry?

You have to go right back to the 1950s, I was growing up in suburban Sydney, times were hard, wages were around (\$9) a week, however, manufacturing industries were booming. In the street where I lived, half was taken up with industry of all types. My dad worked for Bentleys Hemp Rope & Twine Mills.

With wages being low, just about every suburban backyard had a veggie garden and, as the only boy in the family, I had the job of looking after the garden. I was never keen on school, but I loved gardening, watering, weeding, and learning how to feed my garden with organic materials like chook and horse shit and good old garden lime to balance the pH.

Having had numerous jobs throughout the years from packing shelves in a supermarket to the board rooms of major transport companies, in 1989 fate took a turn with the airline industry going on strike for the best part of a year, and I found myself out of work and broke.

Throughout those years I always had a couple of my favourite flowering plants growing; it had become a passion and obsession. I remember



December 24, 1989, as if it were yesterday. I was sitting in a pub with an old mate making plans for the new year, when he passed me an advert for a growing chamber, the famous Phototron, by Julien D DeMarco. It was just one of those moments of inspiration.

In January of 1990 I picked up my first Phototron from a Sydney warehouse (mine was one of four). In March I went back to pick up a second unit, and there in that same warehouse were hundreds of Phototrons waiting to be delivered all around Australia. I was hooked — this is the industry for me.

How was the Ozi Magic range of products started?

There wasn't much of a hydroponic industry at the time, but in the next seven years it went from a few hydroponic business to hundreds around Australia. I started Hydraspher Technologies in 1990 with its own version of the Phototron and a small range of fertilisers. From those early years in the 90s, our business shifted from equipment and fertilisers to just focusing on manufacturing the best fertilisers that years of hands-on research could produce, and the Ozi Magic range of products was born.





“

Our goal is to produce Monsta size hemp plants with desirable characteristics to benefit the myriad of uses.”

What products does Ozi Magic currently sell?

Over the past 30 years we have grown our product range which includes our famous Monsta Bud and Ozi Tonic brands, as well as Ozi Magic Grow Juice, Monsta Grow, Monsta Bloom, Monsta Outdoors, Budswell, Sweet Az, Xellerator, and Terminator. Our products are sold around Australia and New Zealand and throughout the world.

What has changed with the company since the early days?

In recent years our company has recognised the re-emergence of the hemp industry and we obtained our licence to grow, allowing us to research the physiology of the hemp plant. The unique characteristics of the plant has allowed us to explore its ability to consume numerous compounds apart from the known minerals required for plant growth. Controlled testing and analysis of leaf tissue has allowed us to fine tune our fertiliser range with a focus on organic ingredients. Our goal is to produce Monsta size hemp plants with desirable characteristics to benefit the myriad of uses from fibre, food, clothing, medicine, building products, and the list goes on.

What else would you like to say about Ozi Magic?

Our company is only a small part of a much larger industry and in 2016 we held the first HHI Expo (Hemp Health & Innovation Expo), with the aim of educating the general public in all the benefits the hemp plant has to offer and serving as an additional tool in driving this industry forward well into the future.

It's been a great ride to be a part of an industry full of interesting, innovative, and unique people; all of them contributing to the industry we have today. 



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Pop GOES THE Dragon Fruit

Colourful, healthy, delicious, and well-suited to thrive in a hydroponic setup, dragon fruit are quickly becoming popular among indoor growers. **by Dr. Lynette Morgan**

Vividly coloured and clad in scales, dragon fruit, also known as pitaya, is an exotic fruit growing in popularity for its purported health benefits. While native to the tropical rainforests of Central and South America, dragon fruit have been cultivated in Asia for more than 100 years and are now being identified as a potentially profitable commercial greenhouse crop. With skin colours ranging from deep red, pink, or yellow, the flesh is succulent, sweet, and flecked with small black edible seeds. Plants are prolific and fruit size is typically between 0.3-0.4 kilograms, however, some cultivars can produce fruit of up to 0.8 kg. Usually eaten as a fresh fruit with flesh which ranges from white to deep red, pitaya can also be used in juices and smoothies as well as jellies, ices, yogurt, and similar dishes.

Dragon fruit (*Hylocereus* sp.) are a unique crop because the fruit are produced on a large, climbing cactus which, in their native environment, trail up tree trunks and are anchored by aerial roots. Under cultivation, the plants are provided with supports or stakes and pruned to restrict height and improve productivity. Plants are long-lived and can be kept in production for up to 20 years with the first fruit forming within two years of propagation from cuttings. The dragon fruit plant has fleshy triangular stem segments that are tied to trellising systems to support the weight of the fruit and provide a surface to which the aerial roots can anchor. Plants require a warm, humid climate, however, unlike many desert cacti, dragon fruit are sensitive to high light levels and require shading for optimum growth and yields. Having adapted to the growing conditions of a tropical rainforest understory, plants need protection from intense sunlight as excessive light will cause the stems to become bleached and restrict growth. Under hydroponic production the use of shade or net houses provides an ideal climate, however, dragon fruit can also be grown indoors under artificial light sources when plant size and height are carefully controlled. Being tropical or subtropical in nature, dragon fruit plants require warm temperatures in the optimal range of 25-32°C, though temperature sensitivity varies between different cultivars. Most pitaya plants can withstand cool temperatures for a short period of time, although this will delay growth and development. Temperature extremes of below 3°C and above 44°C will damage plant tissue and may result in plant death.

“

Newly raised plants are genetically identical to the parent so will have known fruiting characteristics.”

Propagation and Young Plant Care

What makes dragon fruit a particularly appealing new crop for small hydroponic growers is it can be easily and rapidly grown from seed collected from mature fruit. With dragon fruit becoming more available, extraction of the small, highly viable black seeds from the flesh and germinating these to grow a few plants is relatively simple. Seed should be well washed so all flesh is removed and can be sown immediately onto a sterilised, fine seed-raising medium and lightly covered. Under warm temperatures of 25-27°C these should germinate within three weeks and can be grown until large enough to plant into a hydroponic production system. Young dragon fruit plants make attractive specimens as house plants and have the appearance of a tall cactus with a similar growth habit. The main issue with seed-raised pitaya plants is the time to first fruit production is slower than plants propagated from cuttings, taking up to four years. Seedling growth is relatively slow in the first one to two years. Propagation from cuttings is the preferred method for commercial plantations of dragon fruit and ensures newly raised plants are genetically identical to the parent so will have known fruiting characteristics.

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Young dragon fruit plants grown in a free-draining scoria-based hydroponic substrate.



Seedling dragon fruit plant raised from seed collected from mature fruit.

If cutting material can be obtained from a suitable cultivar, it's a more rapid method of establishing a crop. Dragon fruit plants produce a large number of side shoots that can be removed and used for propagation. Well-hardened cutting material of at least 2.5 centimetres or longer is sliced from the parent plant and the cut surface allowed to cure and callus for a week before planting out. This process helps to prevent rotting during the root formation stage. Cuttings are then placed into a free-draining, sterile rooting medium and left under warm, shaded conditions or on a heated propagation bed until new roots have formed.

Hydroponic Production

Dragon fruit plants can be grown in a containerised system and respond well to the controlled irrigation of hydroponic systems. Since at fruiting the long-lived plants are large and require support, a suitable root volume needs to be provided. Dutch bucket systems or containers with at least 30 cm of depth are suitable for young plants. At the time of planting out, a stake or support needs to be installed for the young plant to climb. The main stem should be pinched out at the top once it reaches the height of the support post. After this, three to four branches will grow and extend outwards. These will bear the first fruit of the plant. Branches need to be guided to grow downwards and have the tips pruned out when they reach almost a metre in length. This helps restrict the height of the plants by preventing unpruned stems growing upwards indefinitely and maintains a more productive and compact plant shape.

Drainage is essential with dragon fruit plants, with substrates such as expanded clay, gravel, and coarse perlite being mediums that help prevent over-saturation of the root zone. Drip irrigation of nutrient solution in either an open or closed system is suitable and helps to maintain aeration around the roots. While dragon fruit require a similar amount of water under warm growing conditions as mature tomato or cucumber plants, this needs to be applied in small but frequent amounts as the root system is quite shallow and fibrous.





Fragrant dragon fruit blossoms last only a single night.

Water and Nutrient Requirements

Like most fruiting crops, dragon fruit requires higher ratios of nitrogen in the vegetative stages of growth and increased potassium when in fruit. Since a number of relatively large fruit are produced in a short time frame on each plant under optimal growing conditions, sufficient potassium needs to be supplied to maintain fruit yields and quality. Pitaya do not require the same high EC that may be applied to crops such as tomatoes to maintain fruit quality. EC levels in the range of 1.0 for young plants up to 1.4 (with a pH of 5.8–6.0) are suitable for long-term production. EC levels should be measured in the drainage or leachate solution draining from each growing container to ensure EC is not climbing during warm growing condition as plants are sensitive to salinity damage. Under optimal temperatures, mature plants can use as much as three to five litres of water per day or as little as 2.2 litres under cool growing conditions.

Flowering, Pollination, and Fruit Set

Under indoor or greenhouse cultivation, dragon fruit can be manipulated to increase the length of the flowering and fruiting period. Being a long-day plant, control over flowering with use of artificial lighting is possible and can increase yields and productivity significantly. While day length can be extended with the use of lighting, it is also possible to induce flowering by using a night break by providing a low level of light between 11 p.m. and 2 a.m., similar to commercial cultivation in Taiwan.

Pitaya are night bloomers and fragrant flowers are only viable for one to two nights with petals opening in the evening and wilting by daybreak. In their native environment, moths and bats pollinate the flowers, however, many commercially available cultivars are now self compatible and do not require cross pollination. Hand pollination, however, can help give higher levels of fruit set and greater fruit weight.

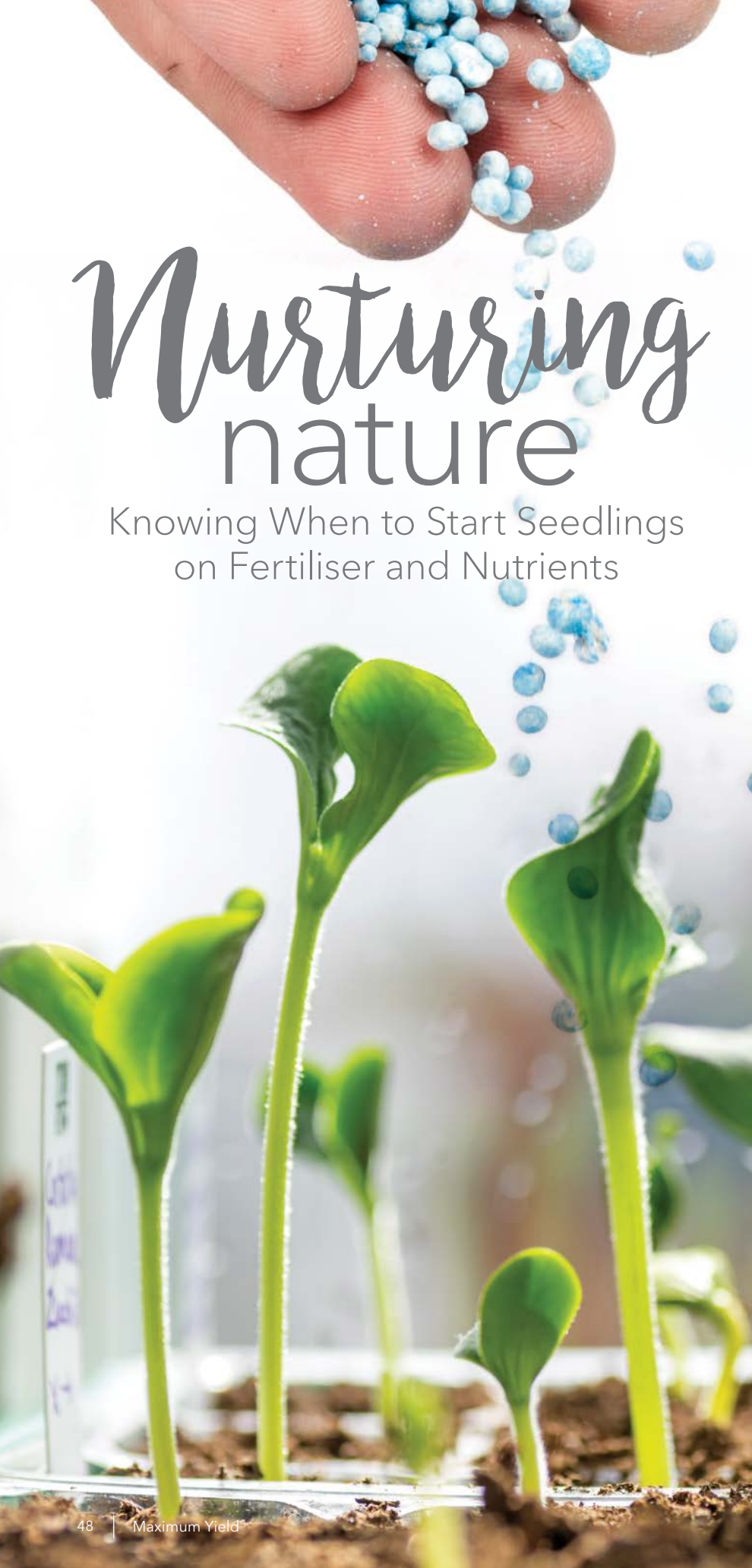
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Like most fruiting crops, dragon fruit requires higher ratios of nitrogen in the vegetative stages of growth and increased potassium when in fruit.”

This process involves physically removing the anthers from one flower and touching them to the stigma of another flower at the time of opening. Alternatively, the pollen can be collected using a small brush and used to pollinate several different flowers. Once pollination has been successfully completed, fruit development is rapid and harvest typically occurs 28 to 30 days after the flower closes. Once fruit have fully expanded and have a good level of skin colouration, harvesting can occur. However, leaving the fruit on the plant for an additional 10 to 15 days has been shown to improve brix (sugar levels) in many cultivars. Brix levels for dragon fruit are usually between 12 to 13 percent but can be as high as 20 percent in the red-fleshed varieties. Once harvested, fruit can be stored for up four weeks at temperatures of 6–10°C with a relative humidity of 90 to 95 percent to prevent desiccation.

Dragon fruit are a fascinating and attractive plant with fragrant night blooming flowers and exotic fruit. They are also a crop with good potential for the well-controlled irrigation and nutrition that hydroponic methods can provide. Through use of artificial lighting, day-length extension, and careful selection of growing substrates, pitaya are likely to become a popular greenhouse and indoor garden specimen. **MY**



A close-up photograph of a hand holding a cluster of small, light blue, spherical fertilizer granules. Below the hand, several young green seedlings with two leaves each are growing in a white plastic seedling tray filled with dark brown soil. The background is softly blurred, showing more of the seedlings and the granules falling through the air.

Nurturing nature

Knowing When to Start Seedlings
on Fertiliser and Nutrients

Delicate seedlings need a little extra attention and knowledge to help them grow big and strong. Follow Kate Van Druff's advice on growing conditions, nutrients, and fertiliser to get your seedlings to the next level.

by Kathryn M. Van Druff

Few things about gardening are as gratifying as watching a tiny seed become a flourishing plant. Flowers, herbs, fruit, vegetables, ornamentals — the possibilities of what you can grow are endless and the journey is memorable year after year.

Many variables come into play as simple seeds start their lifecycles. Starting seeds indoors or outside relies on factors such as the climate and natural or artificial lighting conditions. The timing of planting also comes into play, where seedlings started indoors too early in the season and without suitable lighting can become leggy and thin rather than healthy and robust. Of course, the selected planting medium can also impact the quality of the seedlings you grow, where some potting mixes contain nutrients right from the start and others are merely, well, dirt.

Finding the perfect balance of growing conditions and nutrients isn't always easy. This article will help you to discover the best nutrients and fertilisers for your seedlings and when you should apply them.

Understanding Essential Macronutrients for Seedlings

Introducing fertilisers and nutrients for seedlings can boost growth and production for your plants. Plants require many different nutrients to thrive, particularly oxygen, hydrogen, carbon, which they get through water and air, as well as potassium, phosphorus, and nitrogen, which need to be added through fertilisation. These key nutrients tend to be the most important, but you'll also want to consider micronutrients that can also fortify your seedlings for their best potential.

Nitrogen (N)

As the single most important nutrient for plants, nitrogen is responsible for plant growth, and more specifically leaf growth, plant size, and overall health. Plants supplied with sufficient nitrogen will grow strong and quickly. Nitrogen also plays a key role in photosynthesis, serving as a component of the chlorophyll molecule that makes plants green. As seedlings grow into larger plants, the demand for nitrogen also grows.

Phosphorus (P)

Also vitally important, phosphorus aids plants in creating strong roots, making seeds, and producing fruit, vegetables, and flowers. Phosphorus also aids in photosynthesis by facilitating the plant's energy transfer and allowing plants to use or store energy. Demand for this nutrient is greatest during seed germination and early life, as well as during fruiting or flowering. General weakness and stunted growth are two signs of phosphorus deficiency in plants.

Potassium (K)

The next most essential plant nutrient after nitrogen, potassium helps with many aspects of plant growth and development, such as a plant's size, shape, and colour, not to mention the taste of any produce. Adding potassium to the soil helps plants with the protein synthesis process as well as the activation of growth enzymes. Growth-related issues such as leaf loss, chlorosis (scorching of leaves), weak root systems, and stunted growth may present when plants become too deficient in potassium.

Seedlings and plants also tend to need a large amount of magnesium, calcium, and sulfur. These complete the list of essential macronutrients commonly required for plants and crops.

- Calcium – Calcium strengthens plant tissues and helps to neutralise soil and plant acidity. Calcium in the soil also helps improve water penetration and decrease the soil's salinity.
- Magnesium – This nutrient also helps give plants their green colour, increasing the intake of phosphorus, increases chlorophyll, and allows better CO₂ absorption.
- Sulfur – Sulfur helps plants produce seeds and resist disease. This nutrient also promotes growth, production of chlorophyll, and helps in producing proteins, amino acids, and enzymes.

Together, these six essential macronutrients aid in the creation of chlorophyll, which helps plants convert light into energy for photosynthesis. The process of photosynthesis allows plants to take sunlight, CO₂, and water and turn them into sugar and oxygen. The glucose created then affords plants the ability to use that energy to grow and repair damage or to store it for later. Better photosynthesis enables plants to be more prolific, with better growth and larger and more bountiful yields. Ensuring proper macronutrient fertilisation has a direct impact on plant growth and your future harvest potential.

Best Micronutrients for Seedlings

After you monitor and amend the soil for proper macronutrient content, remember that many diverse nutrients can benefit your plants. As you become a more experienced gardener, you may begin to recognise signs that your plants are craving specific nutrients. You should consider these other key micronutrients to inspire balanced nutrition for your plants.

- Boron supports a plant's membranes in terms of structure and function.
- Copper helps in vitamin A production as well as protein synthesis along with other growth processes.
- Iron aids in food production, energy transfer, and overall growth, to name a few.
- Manganese supports quicker germination, photosynthesis, and aids in various metabolic reactions.
- Molybdenum supports nitrogen fixation.
- Zinc is especially vital as it supports high yields in crops.
- Nickel is essential in urea conversion.
- Chloride supports plant energy reactions.

Plants need lesser concentrations of these micronutrients, yet their presence can have a great impact. Even a slight deficiency in one micronutrient can impact a plant's overall health and growth. Adding organic compost can be an effective way to increase micronutrients in the garden.

“Cotyledons

feed the plant so you don't necessarily need to start feeding right away.”



When Can Seedlings First Have Nutrients?

The soil where your seeds start can have an impact on the future growth of your plants. Generally speaking, seedlings won't need their nutrients until their first full set of true leaves sprouts. Those first leaves that emerge, called cotyledons, are actually part of the seed and will deliver nutrients to get the seedlings started. The cotyledons feed the plant, so you don't necessarily need to start feeding right away.

Once the true leaves appear, you may wish to transfer the seedlings from their current spot to a larger pot or a cell pack. At this point, you can use some potting mix with built-in nutrients, or you may wish to choose your own fertiliser to apply at regular intervals. A diluted, water-soluble fertiliser can deliver essential nutrients for the young plants as they grow. Dissolving fertiliser in water makes it so easy to feed your plants as needed. You can monitor your seedlings to decide if lightly fertilising once or twice per week works best. Signs of over-fertilising may include yellowing leaves, slowed growth, wilting, or buildup of salt. If you've used a potting mix with nutrients already mixed into the soil, proceed slowly with any additional fertilising efforts to avoid harming the plants.

Nourishment Timeline for Baby Plants

Germinate seeds in starter containers or packs. Choose between plain potting medium or nutrient-enriched potting mix.

- **Plain Potting Mix:** After the first set of "true leaves" emerges, apply diluted, water-soluble fertiliser only to seedlings not already fortified with nutrient-rich soil.
- **For a more organic fertiliser route,** consider using nitrogen-rich blood meal, phosphorous-rich bone meal, and potassium-rich kelp meal.
- **As another natural option,** you may also wish to make your own compost.
- **Nutrient-Rich Potting Mix:** When starting from potting mix with added fertiliser, wait six to eight weeks and then supplement the nutrient-rich potting mix with a little fertiliser.
- **Look for clues that your plants may be craving nitrogen,** such as yellowing or slowed growth before adding more fertiliser.

Words of Caution When Fertilising Young Plants

Using too much fertiliser too early on can burn young plants and their roots. It's best to proceed with caution, adding a little fertiliser at a time and increasing as the plants grow and mature. Remember, you can always add more fertiliser, but you can't really undo overfertilisation.

You may also wish to have your soil tested prior to fertilising so you know about any nutrient deficiencies that you should work to correct. Your healthy plants and yields will thank you for it!

It may be true that anyone can stick a seed in a bit of soil, add some water and sunlight, and watch it grow. There's a lot more to it, though. Pay attention each planting season to discover what works best as you familiarise yourself with each different plant you like to grow and which applications produce the best results. With a solid understanding of nutrients, fertilisers, and growing conditions, you can cultivate stronger, healthier, and more vigorous plants year after year. 🌱

“
Signs
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WHY YOU **SHOULDN'T** USE CONSTRUCTION-GRADE CLAY PELLETS IN YOUR HYDRO SETUP

by Kent Gruetzmacher

Clay pellets are a popular medium for hydroponic growers, however, cultivators need to make sure they aren't buying construction-grade pellets.

Kent Gruetzmacher explains the pitfalls of using the **wrong pellets**.

Do-it-yourself (DIY) hydroponic gardening is a rewarding, pleasurable pastime. To this end, designing your own setup (as opposed to buying a kit) saves money on supplies while also teaching many the nuances of hydro growing. As many DIY gardeners know, the design process consists largely of weighing your options on equipment and assessing your buying choices.

While hardware stores can supply some DIY hydroponics needs, certain items still require a trip to the grow shop. While it's often fun to try new things and save money, there are certain elements of your hydro setup you simply can't skip on.

When designing a hydroponic garden, one of the most important choices will be deciding on a cultivation system. Within this frame, many hydro growers opt for clay pellets as their substrate of choice. Yet, there are many clay pellets on the market, with some proving better suited for horticulture than others. Of importance here is the notion of avoiding construction-grade clay pellets in your hydro setup.

What are Clay Pellets?

Both the indoor gardening and construction industries utilise clay pellets referred to as "LECA clay." The term LECA is an abbreviation for "lightweight expandable clay aggregate," which is also sometimes referred to as "expanded clay." The standout feature of LECA clay is how it is formed, with the material expanding into extremely lightweight pellets when heated at more than 1,093°C. Interestingly, this extreme heat causes the clay to expand with air pockets, giving LECA its signature light mass.



Clay pellets allow for excellent root zone health and drainage.

Clay Pellets for Hydroponic Growing

Clay pellets for hydroponic growing are made with the same process as all LECA clays. However, special attention is paid in manufacturing these pellets so harmful materials aren't accidentally mixed with the clay. As such, clay pellets found at hydro stores are considered food grade because they are free of harmful impurities. Therefore, store-bought clay pellets such as hydrotons can support a plant's delicate root system without exposing it to harmful impurities.

There are many motives for choosing to grow crops in clay pellets like hydrotons. To begin with, because they are lightweight and porous, clay pellets retain water while also allowing for excellent root zone drainage. Also, many growers prefer clay pellets because they are considered pH-neutral and won't cause imbalances in nutrient mixes. Finally, clay pellets are extremely durable and can be reused many times as long as they are cleaned between harvests. While these factors doubtless make clay pellets attractive for hydro growing, it's important you purchase the correct LECA clay products for your needs.

"Because it is difficult to determine the precise mineral composition of construction-grade pellets, troubleshooting a hydro system with them in play is virtually impossible."



Issues with Construction-Grade Clay Pellets

On the macro level, construction-grade clay pellets are made in the same way as other LECA clays. However, construction-grade clay pellets are produced specifically as an ingredient for lightweight concrete. Because concrete mixes don't require food-grade purity, this LECA clay is manufactured with few controls in place regarding contaminants.

LECA clay pebbles are formed from standard clay that is extracted from the ground. Generally, for construction-grade pellets, LECA producers will utilise the most convenient clay source in their manufacturing facility, regardless of quality. Therefore, because there is a lack of quality control on this clay, it could contain impurities that are harmful for plants. Similarly, with a disregard for the good manufacturing practices (GMP) that come with food-grade pellets, construction-grade pellets can also be stored with potential contaminants such as concrete, limestone, and mortar.

The contaminants found in construction-grade clay pellets can lead to devastating pH imbalances in your hydroponic setup. To this end, overabundances of minerals such as limestone can cause unpredictable rapid spikes in pH levels that can prove toxic for plants. Even more, because it is difficult to determine the precise mineral composition of construction-grade pellets, troubleshooting a hydro system with them in play is virtually impossible.

There is also a concern that the inconsistent sizing of construction-grade clay pellets could cause problems in a garden. Unlike hydroton pellets, construction-grade pellets are not sized with cultivation purposes in mind. Therefore, if pellets are too small, they may pack too tightly and choke the rootzone off from valuable aeration. Conversely, oversized pellets may absorb too much water and wreak havoc on the water levels of your hydro system.

Stick to What's Proven

DIY hydroponics can be fun and educational. However, there are certain elements of your setup where you should stick with proven methods. Of these, it's vitally important to use cultivation mediums that are known to work successfully in hydroponics. In the case of LECA clay pellets, it seems you can't beat the quality and reliability of products engineered specifically for horticulture.

One of the most attractive elements of hydroponics is the amount of control it allows you over your garden. To this end, savvy hydro growers can make precise choices on nutrient regimes and quickly pivot with imbalances of pH. Unfortunately, adding a wildcard to your hydro setup like construction-grade pellets removes many of the controls that have come to define hydroponics. While it's great to save money on our gardens and try new things, sometimes it's best to follow proven standards. ●



a brief HISTORY OF AVOCADOS

by Philip McIntosh

Humans have cultivated avocados for millennia, but it took millennia to come up with avocado toast.



Purplish-black and leathery on the outside; green turning to yellow when ripe; soft and creamy on the inside with a rock-hard pit in the middle — that is an avocado. This tree-born fruit (technically a berry) hails from central Mexico, with evidence of human cultivation back as far as 5,000 years. Archeological evidence suggests people have been using avocados for as long as 9,000 years. So, it seems that at about the same time that corn, beans, and squash were coming into widespread use in Mesoamerica, so too was the avocado, at least in the regions where the plant was endemic.

The fruit has been known as the avocado pear or alligator pear (because of its shape and usually knobby and somewhat wrinkled skin), but most people just call them avocados these days (occasionally shortened to just “avo”). The scientific name is *Persea americana*, with the genus name *Persea* apparently deriving from an old Greek name for a different tree species known as Assyrian plum (*Cordia myxa*). How that came about is not exactly clear, but the specific epithet “americana” means from or of the Americas.

The avocado may originally hail from Central America, but it is now grown in many places where the climate is warm and sunny with little chance of frost. The only places in Australia that avocados grow are Atherton Tablelands/ Mareeba, Riverland, Sunraysia, Pemberton, and Perth. There are many varieties in cultivation including Fuerte, Bacon, Lulu, and Hass. Fuerte was once popular but Hass is the type commonly found in grocery stores these days.

The avocado is considered a “low processing” fruit, meaning you don’t have to do much to it to get it to market. Avocados have the convenient property of not ripening on the tree (in nature they ripen after they fall off the tree),

meaning they can be picked to ripen after they get to their destination. Avocados are tough, too, which makes packaging and shipping easier than it is with more delicate fruit.

Mexico remains the world’s largest producer by far with export market share greater than 40 percent in 2019. Interestingly, the Netherlands is a big exporter of avocados. Since you can’t really grow avocados economically in Holland, what is the deal with that? It turns out that the Netherlands imports avocados in quantity, mostly from South America and South Africa, and then exports them to other European countries for a profit.

Including domestically produced fruit, about 20 percent of all the world’s avocados are consumed in the U.S. That’s a lot of guacamole and avocado toast.

Speaking of guacamole and avocado toast, what are avocados good for anyway? The avocado has a umami flavour all its own that lends itself to many savoury or even sweet dishes. The texture is often described as “buttery.” Avocados are considered to be nutrient and photochemically “dense,” meaning they have a lot of good stuff in them. Stuff like fibre, potassium, magnesium, vitamins A, C, E, and K, folate... and more. Plus, avocados are rich in mono- and polyunsaturated fatty acids (the good kinds).

Although outdoor cultivation is limited to tropical areas, the avocado makes for an attractive house plant even though it is unlikely to ever develop fruit indoors. Sprouting avocado seeds is relatively easy. Give an avocado seed (the pit) a good cleaning and use toothpicks to suspend it over a glass or bowl with half of the fat end submerged in water and wait awhile. Eventually, you’ll be rewarded with an attractive addition to your plant collection. 

distribution LIST

retail stores are listed alphabetically in each state

ACT

South Pacific Hydroponics
#2 - 84 - 86 Wollongong St.
Fyshwick ACT 2609
(02) 6239 2598

South Pacific Hydroponics
70 Oatley Crt.
Belconnen ACT 2617
(02) 6251 0600

NEW SOUTH WALES

24/7 Hydroponics
151 Wine Country Dr.
Nulkaba NSW 2325
(02) 4990 4291
admin@simplydvine.com.au

99 Trading
57 Hoskins Ave.
Banks Town NSW 2200
(02) 9790 1525

Accent Hydroponics
Unit 1/5 Clerke Pl.
Kurnell NSW 2231
(02) 9668 9577
accenthydroponics.com

ASE Hydroponics
Factory 10/45 Leighton Pl.
Hornsby NSW 2077
(02) 9477 3710

Ballina Hydro
19 Cessna Cres.
Ballina NSW 2478
(07) 3354 1588

Criscete Hydroponics and Organics
Unit 2/15 Kam Cl.
Morisset NSW 2264
(02) 4973 5779

Cougars Hydroponics
2/6 Ace. Cres
Tuggerah NSW 2259
(02) 4330 0190

Dubbo Hydro & Tobacconist
42c Victoria St.
Dubbo West NSW 2830
(02) 6885 1616

Earth & Colour Vertical Gardens and Hydroponic Supplies
1/43 Corporation Cir.
Tweed Heads South NSW 2486
(07) 5523 9565
earthandcolour.com.au

Favgro Hydroponics Growers
107 Glenella Rd.
Batehaven NSW 2536
(02) 4472 7165

Felanza - Hydroponics
140 Princess Hwy.
Arncliffe NSW 2205
(02) 9556 1494

General Hydroponics
7/14 Sunnyholt Rd.
Blacktown NSW 9676
(02) 9676 8682

Grow Your Own
Unit 6/34 Alliance Ave.
Morisset NSW 2264
(02) 4973 5179



Holistic Hydroponics Pty. Ltd.
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Rouse Hill NSW 2155
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Home Grown Aquaponics
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Thornton NSW 2322
(02) 4028 6388
home-grown.net.au

Hong Hung
D5 303 The Horsley Dr.
Fairfield NSW 2165
(02) 8764 1083

Hyalite Kingsgrove
1/4 Wirega Ave.
Kingsgrove NSW 2208
(02) 8068 5896

Hyalite Prestons (New South Wales)
2/4 Avalli Rd.
Prestons, NSW 2170
(02) 3824 3400

Hyalite Villawood
2/21 Birmingham Ave.
Villawood NSW 2163
(02) 9723 7199

Hydro Experts
34/2 Railway Parade
Lidcombe NSW 2141
(02) 8041 7959
info@hydroexperts.com.au
hydroexperts.com.au

Hydro Masta
100 Station Rd.
Seven Hills Sydney NSW 2147
(02) 8812 2845

Hydro Place
1/68 Nelson St.
Wallsend NSW 2287
(02) 4965 6595

Hydro Shop Pty Ltd
Unit 1/5-7 Channel Rd.
Mayfield West NSW 2304
(02) 4960 0707

Hydro Supplies
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Darlinghurst NSW 2010
(02) 9326 0307

Hygrow Horticulture (Greenlite)
252 Oxford St.
Bondi Junction NSW 2022
(02) 9369 3928

Indoor Sun Shop
745 Victoria Rd.
Top Ryde NSW 2112
(02) 9808 6873

Indoor Sun Shop
Unit 2/109 Junction Rd.
Moorebank NSW 2170
(02) 9822 4700

International Fans
PO Box 120
St. Mary's NSW 2760
(02) 9833 7500

Kyper's Tools and Hydroponics
Stuart & Tincogan Sts.
Mullumbimby NSW 2482
(02) 6684 4928

Lismore Hydro
1/106 Canway St.
Lismore NSW 2480
(02) 6621 3311

Lismore Hydroponics
Rear of 28 Casino St.
South Lismore NSW 2480
(02) 6621 3311

Lux Cutting Hydroponics
252 Oxford St.
Bondi Junction NSW 2022
(02) 9369 3928

North Coast Hydroponics
2/5 Wallis Ave.
Toormina NSW 2452
(02) 6658 7932
northcoasthydro.com.au

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South Grafton NSW 2460
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Northern Nursery Supplies Pty Ltd
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Kempsey NSW 2440
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Nowra Hydro
68 Bridge Rd.
Nowra NSW 2541
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Nutriflo Hydroponic Systems
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Gosford West NSW 2250
(02) 4323 1599
nutriflo.com.au

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Nowra South NSW 2541
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Pt Macquarie NSW 2444
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Pendle Hill NSW 2145
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Quick Grow
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S. Hurstville NSW 2221
(02) 9546 8642

Quik Grow Pty Ltd.
490 Parramatta Rd.
Petersham NSW 2049
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Richmond Hydroponics
Unit 3/84 Bells Line of Rd.
North Richmond NSW 2754
(02) 4571 1620
richmondhydroponics.com.au

Simple Grow

Hassall St. & Windem
Wetherill Pk NSW 2164
(02) 9604 0469

South Pacific Hydroponics
84-86 Wollongong St.
Summer Park NSW 2609
(02) 6239 2598

Sydney Garden Supplies
187 Waterloo Rd.
Greenacre NSW 2190
(04) 1460 9241

The Green Room Hydroponics & Organics
2/2 Davids Cl.
Somersby NSW 2250
(02) 4340 0339



The Grow Shed
4/22 Alliance Ave.
Morisset NSW 2264
(02) 4972 6872

The Grow Shop
5/5 Forge Dr.
Coff's Harbour NSW 2450
(02) 6651 9992

The Petshop Boyz
Unit 1/ 5-7 Channel Rd.
Mayfield West NSW 2304
(02) 4960 0708
petshopboyz.com.au

TN Hydroponics
1/43 Chadderton St.
Cabramatta NSW 2166
(02) 9724 5692

Tweed Coast Hydroponics
2/58 Machinery Dr.
Tweeds Head South NSW 2486
(07) 5524 8588

Uncle Wal's Gardenland
31 Cres. Ave.
Taree NSW 2430
(02) 6550 0221

VN Hydro
8 Robert St.
Belmore NSW 2192

Warrarong Hydroponics Centre
240 Cowper St.
Warrarong NSW 2502
(02) 4274 8001
warraronghydro@hotmail.com

Westside Lighting & Electrical (Ezi Range)
PO Box 274
Mascot NSW 1400
1 800 661 475

Wollongong Hydroponic Centre
318 Crown St.
Wollongong NSW 2500
(02) 4225 8773

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5/8 Andrews St.
Berrimah NT 0828
(08) 8947-2576

Katherine Hydroponics Centre
17 Rundle St.
Katherine NT 0850
(08) 8972 1730

Top End Hydroponics
1785 Leonino Rd.
Darwin River NT 0841
(08) 8988 6076

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Ormeau QLD 4208
0435 255 856
adhs.com.au

Advanced Horticulture Supplies - Noosaville
Shop 3 11 A Venture Dr.
Noosaville QLD 4566
(07) 5641 1256
adhs.com.au

Allgrow Hydro
13 - 58 Bullock Head St.
Summer Park QLD 4074
(07) 3376 7222



Aqua Gardening
Unit 3, 4 Billabong St.
Stafford, Brisbane QLD 4053
(07) 3354 1588



Aqua Gardening
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Enoggera QLD 4051
(07) 3354 1588

Aquatic Oasis
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Capalaba QLD 4157
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Billabong Hydroponics
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D-Bay Hydroponics Shop
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(07) 4035 5422

Hydroponics Today
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Indoor Solutions
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J&K Hydroponics
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Wacol QLD 4076
(07) 3271 6210

KY Garden
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Darra Brisbane QLD 4076
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Slacks Creek QLD 4127
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loganhydroponics.com.au

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Pleystowe QLD 4741
(07) 4959 2016

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Slacks Creek QLD 4217
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Sunstate Hydroponics
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(07) 5445 3499

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Withcott QLD 4352

Tumbling Waters Hydroponics
2 Clarkes Track
Malanda QLD 4885
(07) 4096 6443

Walsh's Seeds Garden Centre
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Toowoomba QLD 4350
(07) 4636 1077

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adelaidehydro.com.au



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39a Manton St.
Hindmarsh SA 5095
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Highland Grow & Flow
14/1042 Grand Junction Rd.
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13 Research Rd.
Pooraka SA 5095
(08) 8260 2000



Hush Hydroponic Wholesalers
25 Charlotte St.
Smithfield, SA 5114
(08) 8254 1585

Hydro Heaven
Kane Motors-Hunt Rd.
Mount Barker SA 5251
(08) 8391 1880

Hydro Sales & Service
1 Salisbury Cres.
Colonel Light SA 5041
(08) 8272 2000

Hydro Technics
321 South Rd.
Croydon SA 5008
(08) 8241 5022

Hydro Technics North
22 Peachey Rd.
Elizabeth West SA 5113
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10 facts on BASIL

by Philip McIntosh

Not to be confused with the city in Switzerland, this popular herb is a staple of Mediterranean cooking.



- 1 **Known by** the binomial *Ocimum basilicum* (another one named by the great Linnaeus), basil, a member of the Lamiaceae (the mint family), is a soft herb with dark green leaves and squarish stems.
- 2 **Native to** parts of India, Africa, and Asia, the basil plant is now found in cultivation all over the world.
- 3 **Although only** a few members of the genus are of culinary interest, there are more than one hundred species of *Ocimum*, including both herbaceous and woody types.
- 4 **Like other** members of the mint family, basil leaves have a strong but pleasantly pungent odour that hints at their use as a flavouring agent.
- 5 **As a** food ingredient, basil is most often used fresh, since cooking reduces the flavour considerably.
- 6 **Sweet basil** is probably the most popular cultivar but others such as purple, bush, lemon, Thai, and dwarf varieties have found their way to market.
- 7 **From a** nutritional standpoint basil fares pretty well, being low in calories, a good source of vitamin A and antioxidants, with small amounts of many minerals thrown in.
- 8 **The shiny** leaves of the basil plant are a good source of essential oils such as methyl chavicol, linalool, myrcene, pinenes, and many others.
- 9 **Although generally** recognised as safe (GRAS) by the USDA, basil also contains the known carcinogen estragole, which researchers caution might increase cancer risk if ingested in large amounts.
- 10 **On the** other hand, some studies suggest basil has numerous health and medicinal benefits including anti-tumour activity against certain cancers.

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