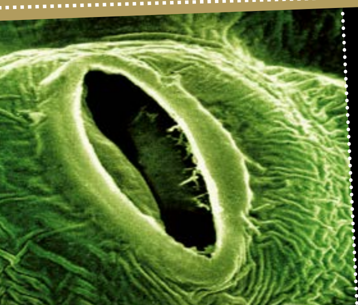
CANNAtalk®

MAGAZINE FOR SERIOUS GROWERS

ISSUE 36 2017

PLANT ENVIRONMENT

It's kind of important

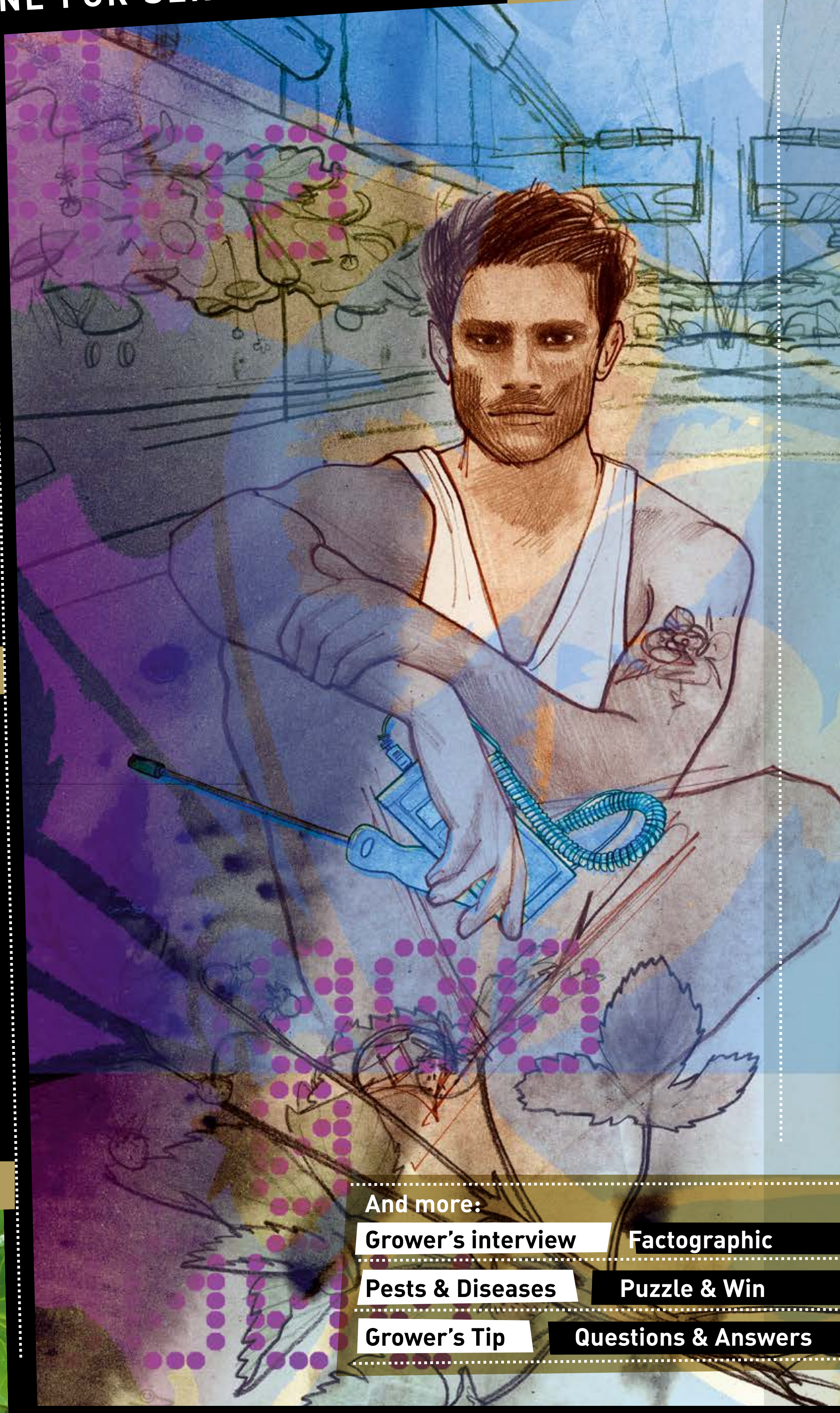


TINY HOMES

Quality, not quantity

BRUSSELS SPROUTS

Surprisingly tastey!



And more:

- Grower's interview
- Factographic
- Pests & Diseases
- Puzzle & Win
- Grower's Tip
- Questions & Answers

Foreword

HQ Talk:

Winter is just about done. I have probably just about shed all the excess weight from an overly glutinous Christmas period, just in time for an easter chocolate binge. Isn't it strange (and great) how Christian holidays have lost all their religious connotations and essentially become about how much food you cram in your face before falling asleep on the sofa and begin drooling over yourself. Or is that just me?

So, anyway, the next growing year is almost upon us. My propagation area is crammed full of all sorts of seeds germinating away and my head is full of hopes and dreams that my allotment will be something that will make even Charlie Dimmock proud this year. Every year there is one pest that thwarts my ventures: Aphids. Good lord I hate them. I know thats a strong word but I truly do. So why not join us in our pests and diseases section which goes into exactly what they are all about. "Know thy enemy and thine illegal war will becom-eth easy." I'm sure our Lord Saviour said something similar once didn't he? Or was that Tony Blair? I always get those two confused..

Growing environment is also a biggie for us this issue. The environment is bit of a hot topic globally at the minute, so we thought we would mirror that in so much as how conditions in your grow room affect your plants. Being pretty much the most important thing you can control in your grow room, we felt focusing on your growing environment would be the perfect way to kick this years CANNAtalk off! We can only hope that Donald Trump follows suit, but we will not hold our breath.

Nico Hill

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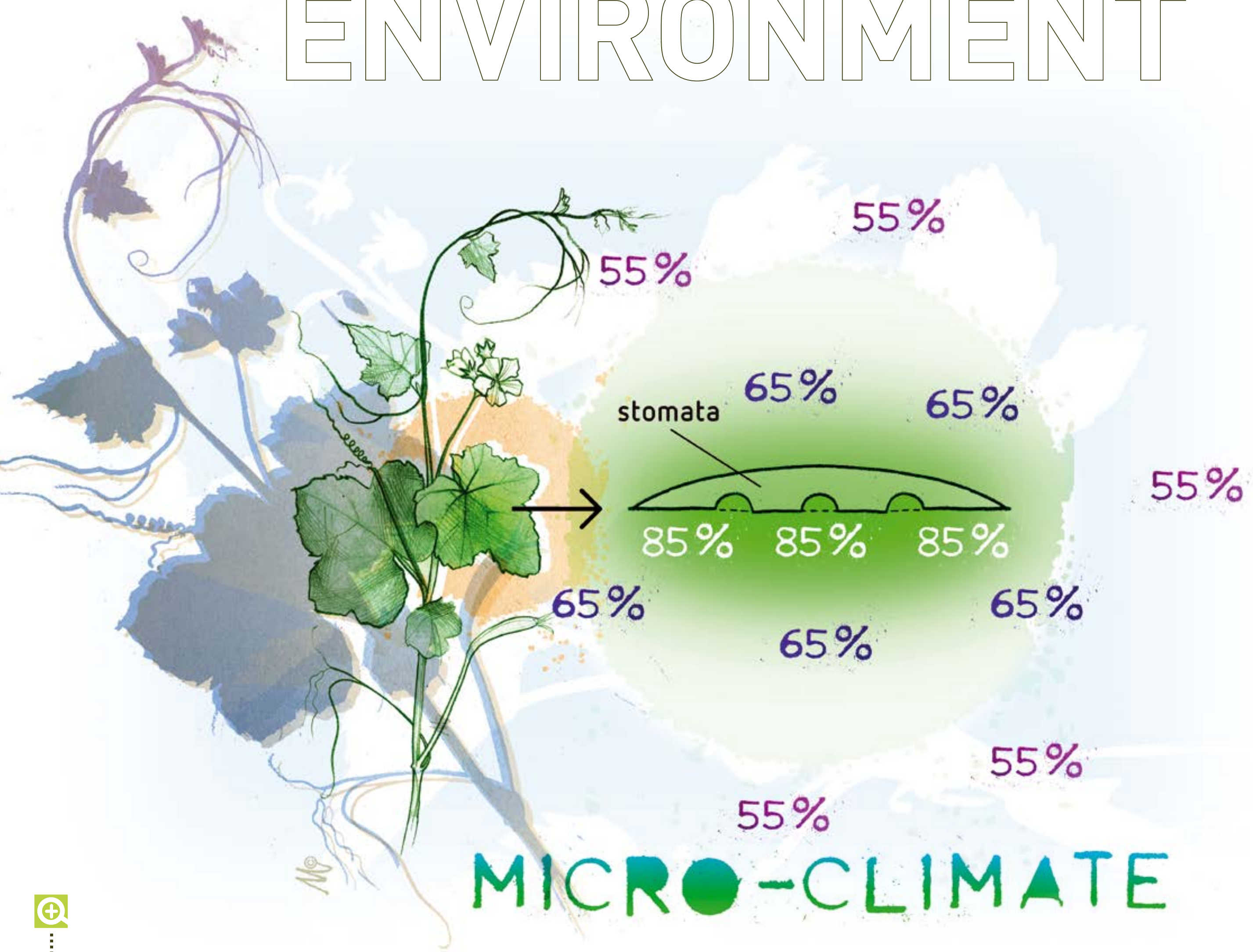

Figure 1 : You can see here in the illustration that the surrounding environment of the leaf is roughly 60% humidity. Directly under the leaf and immediately surrounding the stomata, the RH builds up in this area as water vapour is released during transpiration.

THEY'RE FUNNY OLD THINGS, PLANTS. SURVIVING ON A COMPLETELY DIFFERENT SET OF RULES TO ANIMALS, IT'S SOMETIMES HARD TO FATHOM EXACTLY WHAT IT IS THAT MAKES THEM TICK. ALL TOO COMMON A MISTAKE FOR A GARDENER IS TO FOCUS ON THEIR (MORE-OFTEN-THAN-NOT RATHER EXCESSIVE) FEEDING REGIME, LOOKING FOR SOME SORT OF MAGIC IN A BOTTLE TO MAKE THINGS RIGHT.

By NICO HILL

It's hard to argue with some marketing though, "Doubles your yield" right? Says it right there on the bottle plain as day, I'll take three please good sir.

The more savvy or seasoned gardeners out there will know through experience (or having fallen folly to such claims) that a plant needs attention in areas other than just what bottle of feed can provide. The immediate environment around the plant is something that if properely controlled, will give you more benefit than any bottle of jazz you can frantically pour into your reservoir.
We're not just talking about the immediate environment around the leaves either. Granted, that is the most obvious place to start looking, but you will need to go deeper than that to gain complete control of things. The roots of a plant also have their own immediate environment to cope with (that of the substrate) so you will need to become a master of the unseen. Balancing the conditions above and below ground is the name of the game here, and the prize? A harmonious harvest.

Above Ground

So let's start with the above ground bit. How exactly do the different variables in the conditions of the air impact a plant? Well, it essentially all boils down to the stomata on a leaf and what they do in different environment conditions. They are a key feature in a plant. Understanding how they react to changing environments is the goal of the day here.

Most gardeners are aware of these being responsible for the plant being able to photosynthesise. They open during the day to let in CO_2, allowing for the production of energy via photosynthesis. That is a small part of the story though! The larger part of the story is that it needs to cool itself from associated daytime heat, coming from both the ambient air temperature and IR heat from the light source. This is all done via little pores on the leaves called stomata. They don't just open to a set amount, stay like that, and then shut themselves up again for a good snooze overnight though. They are in constant flux the entire day, opening and closing different amounts in reponse to what is happening with the plant as a whole, and how the following factors may have effected them.

Light

Light plays an important part for many processes in a plant, too many to go into for this article. What you need to bear in mind here is that aswell as triggering and influencing the rate of photosynthesis (the more photons of light available per second, the higher the photosynthetic potential), light generates heat (particularly in the form of Infra Red) which the plant both makes use of (to speed up the assimilation process) but also needs to mitigate against which it does by opening up its stomata, in order to transpire more. At night-time (or lights off) the stomata close, where-as in daytime (or when lights turn on) they will open to varying degrees, partly dependant on the amount of light they receive over time.

As a general rule, if you half the amount of light (dim ballasts down to 50% or turn half of your lights off) you will reduce the amount of transpiration that is occuring as less heat is generated. However it will also reduce the amount of energy being produced through photosynthesis by a relative amount. So, ideally, it is best left as a last-resort scenario. However, in an indoor grow room, at the end of a particularly hot and dry day, it can often be the easier solution in a grow room to limit light intensity when the plant has suffered from extreme water loss throughout the day. Outdoors, this is likely to be in the middle of the day, where sun screening may become necessary.

Temperature

Temperature has a direct impact on the stomata of a plant. The higher the air temperature (or amount of Infra-Red in the light spectrum) the more the plant will need to transpire in order to cool itself down to an ideal temperature (and also from the knock on effect a raise in temperature has on humidity).
The hotter the plant is, the more it needs to cool itself. The more it needs to cool itself, the wider the stomata will open. The wider the stomata open, the more it can transpire and cool itself. The vast majority of the water your plant consumes during its life is used to cool itself. Ninety-nine per cent is lost to transpiration, leaving only 1% for other proccesses, including photosynthesis!

Guidelines on particular temperatures to maintain obviously vary depending on what the ultimate goal is with whichever species of plant you will be growing. Ideal temperatures can also vary with changes in environmental factors, such as supplementing CO_2. As a general rule, you want to consider what is happening with your temperatures over an average 24 hour period. The temperature differences you can create between the day and night period around this average can then be used to impact how the plant uses its energy.
With no temperature difference (Diff = 0. Example: 24C in the day and night time period), the plant will naturally steer the energy produced during photosynthesis into vegative growth (new leaves and shoots). Having a larger

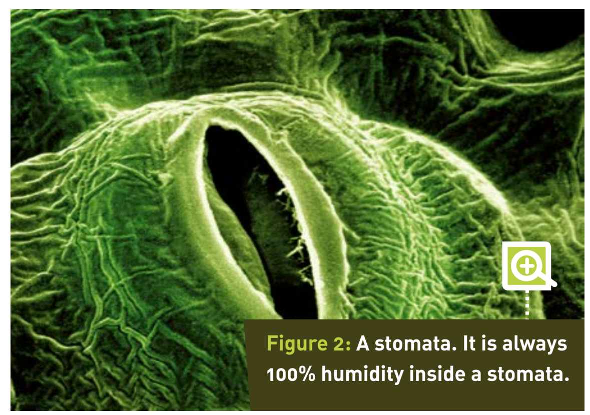

Figure 2: A stomata. It is always 100% humidity inside a stomata.

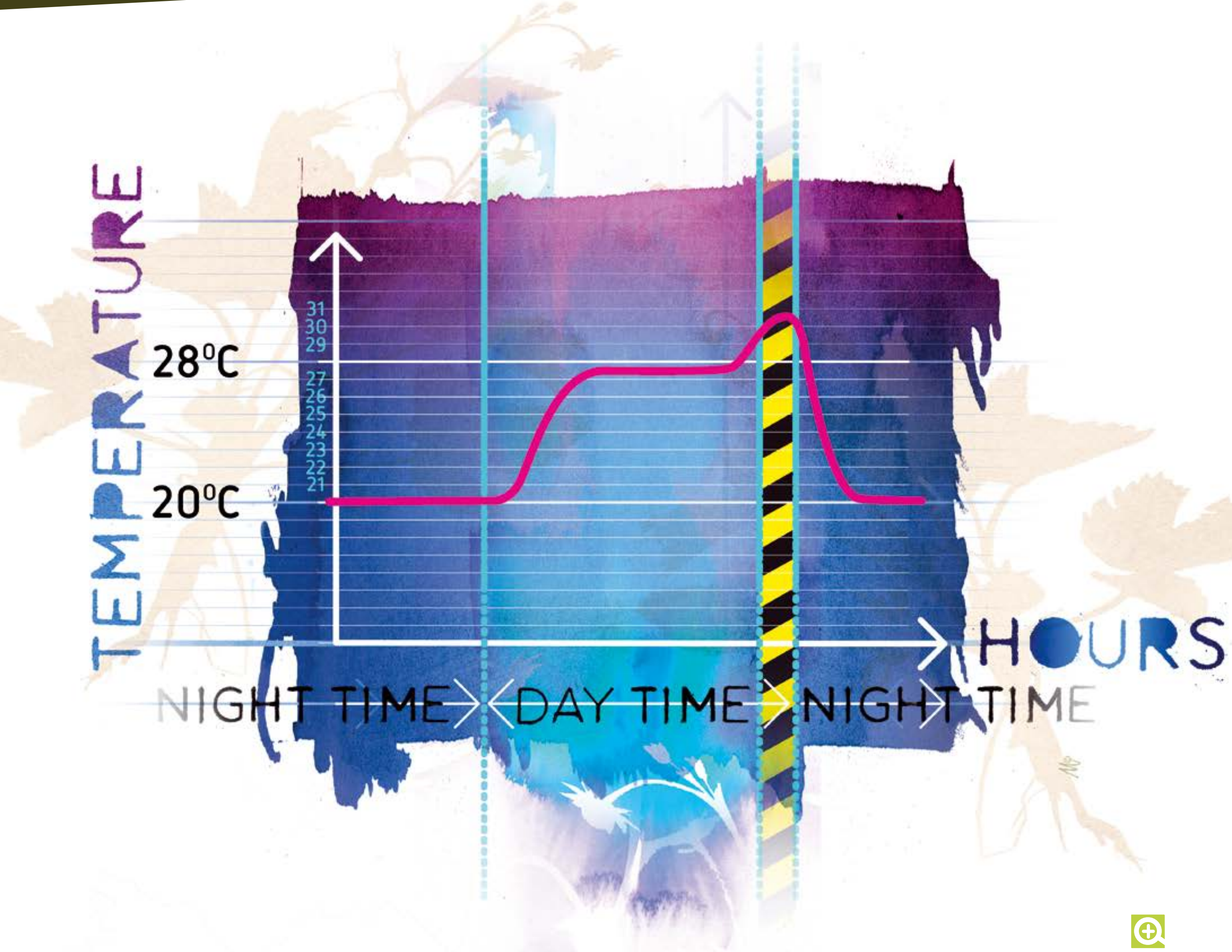

Figure 3: Infra-red thermometers, and dataloggers are the tools of choice when you are wanting to correctly monitor the VPD. A spike in air temperature on the graph (usually towards the end of the day(lights on)) will indicate closed stomata. Dimming lights is an easy solution for this problem, though the root cause will still need addressing.

temperature difference (Diff = 8 degrees. Example: 28C when lights are on down to 20C when lights are off) will encourage that energy to go into the production of flowers/fruits/seeds. So as a rule of thumb, stick to a smaller difference during vegetative growth and a larger difference during the flowering period. It is worth noting that at higher temperatures, all metabolic processes (like photsythesis) happen at a faster rate. So more photosynthesis, and therefore energy production, is possible at higher temperatures, but of course not if it is so high a temperature that the plant can no longer cope with cooling itself.
Also, temperature is not really a standalone variable, unfortunately it isn't that simple. It is directly linked to the next variable we need to consider: Humidity.

Relative Humidity (RH)

The lower the RH of the air, the easier it is for water vapor to pass from inside the 100% humid stomata, to the outside world. You can liken this to a busy train pulling up to a busy train station platform. If both the train and the platform are 100% packed full of people, no-one is going anywhere when the doors are open. If the platform is only 50% full, then there is freedom for movement.

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It's not quite as simple as a train platform analogy though. As the RH of the air falls, it creates a 'suction' on the vapour in the stomata, causing transpiration to increase. So to account for this, the stomata will close if they sense the humidity becoming too low. Conversley they will open wide in the presence of high humidity, to compensate for the opposite effect this has. The reason temperature is linked directly to humidity is because of the lovely little word 'relative'. Without the word 'relative', strictly speaking it is a measurement of the amount of grams of water in a metre cubed space. This is not very useful to a grower as over different temperatures, this water vapour in the air changes its physical properties. So 'Relative Humidity(RH)' is used as this takes into account the effect that a varying air temperature has on a set amount of water in the air. Essentially it is a ratio of the air's water vapor content to its water vapor capacity, at a given temperature. All you need to know though is what RH your hygrometer displays as a percentage and what temperature it is at the time.

As the inside of a stomata is always maintained at 100% RH, the temperature of the plant directly affects the air pressure inside of it. The higher the temperature of the leaf (as a result of light radiation), the higher the temperature inside the stomata and so the higher the air pressure inside of it becomes. This results in more of the pressurised air inside of the stomata, diffusing into the lower pressured air of the outside world.

	100%	75%	50%	25%
28°C	4L	3L	2L	1L
20°C	3L			
5°C	1L			

A table showing the amount of water(in litres) a cubic metre of air can hold, over different temperatures. Basically, air can hold more water at a higher temperature. These are not actual figures but more to easily represent what is actually occuring.

So what does this mean for your grow room? Well if you have a look at the above table, we can go through a couple of examples to convey how this can impact you. Imagine youself in a normal grow room. The lights are on, it is 28 degrees C, 75% humidity and your nose is full of the glorious scents of your favourite flowers. Your lights turn off and the temperature drops down to 20 degrees. What happens to the humidity? You can see from the table that at 28ºC and 75% RH there are 3 Litres of water in the air. When the temperature goes down to 20ºC, the 3 Litres are still in the air but result in a new relative humidity of 100%. Summary: Lights go out →→ temperature goes down →→ Relative humidity goes up.

Another example is that it is winter. It's cold, wet and rainy outside. The temperature is just scraping 5ºC and with all the rain the RH is 100%. You have a wonderful new intake system that is pumping this air directly into your growroom. Problem is your room is running at a truly tropical 28ºC, so what impact does this have on the RH? From the above table you know there is 1 litre of water in every metre cubed of air at 100%RH and at 5ºC. As the air is brought into your room, and this 1 litre of water vapour is heated up to 28ºC, you can see that the RH drops down to 25% and ironically you end up with extremely dry grow room conditions.

Vapour Pressure Defecit (VPD)

Although it is maybe easier to understand, it's not really a 'suction' from the dryer air that causes the changes in transpiration rates.
It actually all boils down to differences in the air pressure inside the stomata, compared to the air pressure outside of the stomata.

The finer details of VPD are fairly in depth (and can be found in issue 21 of CANNAtalk), but the key useful information an average grower needs to bear in mind about VPD is that the temperature of the leaf surface, should be lower than that of the surrounding environment. If it isn't then the plant has closed off its stomata, as it has ran out of its internal water storage and cannot keep up an adequate water supply from the roots to match the transpiration requirements of the leaves. This is almost the worst case scenario for a plant. It can no longer adequately cool itself, leaf burn will begin promptly at the tips and if not properly addressed, early autumn colouring will soon be on its way!

Air Refreshment

Unless you are running with a closed loop environment, regularly refreshing your volume of air will be the main way in which you will controll your average temperature. However, its chief responsibility is to refresh the CO_2 in the room, and to clear the build up of humidity. To choose an adequate ventilation system you need to take into account many things. The size of the room and the wattage of light being the most important factors to consider, ultimately too many things to go into for the purpose of this article. Beyond simply moving enough air, the main thing you need the equipment to have is a high level of functionality. Temperature controlled extraction systems being most ideal so you are able to manipulate and control both night and day temperatures.
Also bear in mind the temperature of the intake air: if it is particularly cold, then introduce it towards the top of a grow room so it has a chance to heat up before reaching

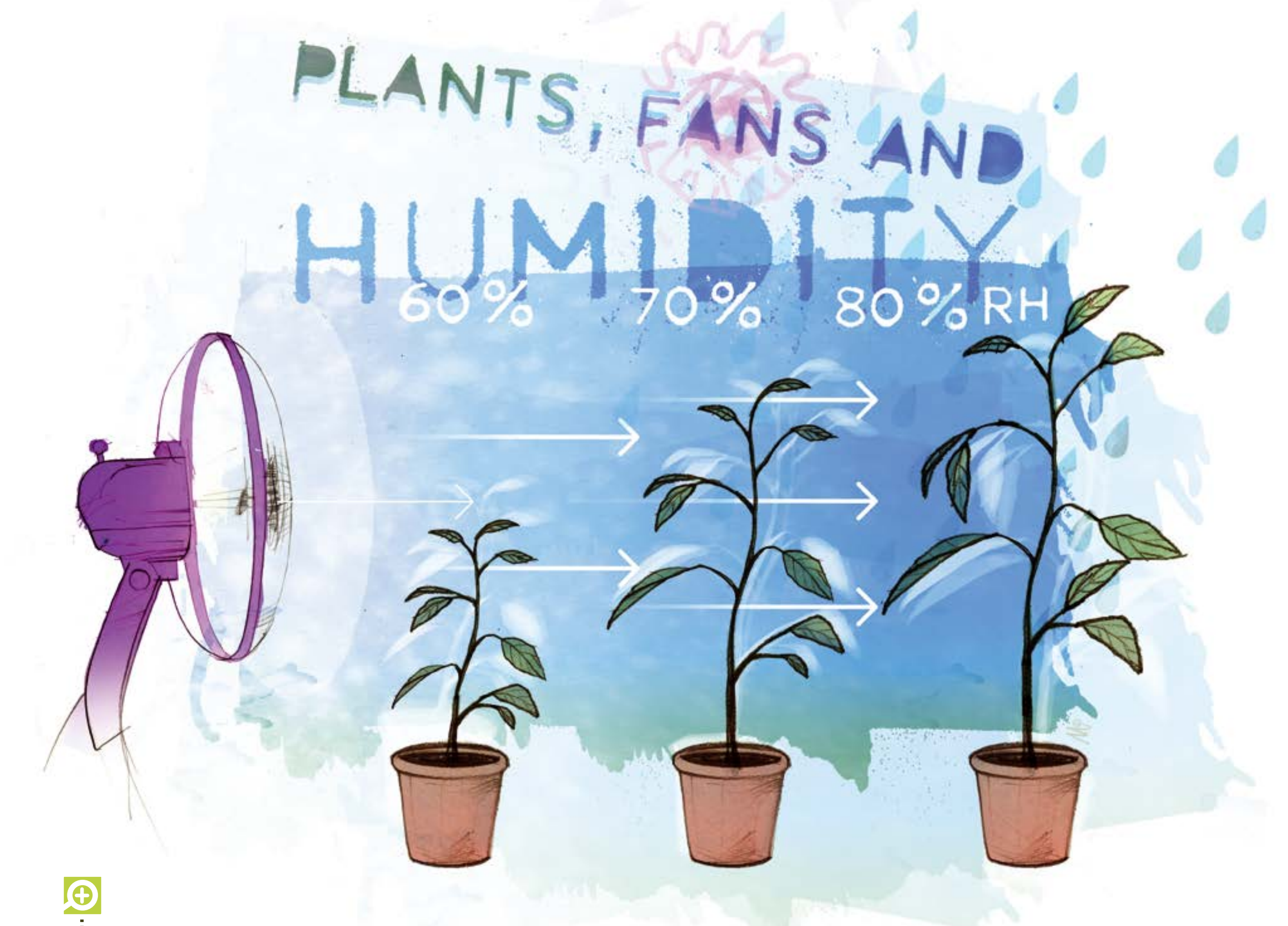

Figure 4: The fan blows horizontally across the plants, moving the air from one plant to the next. The RH builds up across each plant as it moves from one side of the room to the other. The plants towards the left will be transpiring proportionally more than the plants towards the right.

plant level. Alternatively if you are bringing in hot summer air, try to introduce this towards the bottom of the grow room so it doesn't get the chance to heat up any more (from the energy from your lights) before it reaches your plants.

Air movement

You want to create as even a micro-climate for every plant in your room, in every section of your room. Where you place your room fans is crucial to making sure this happens. You dont want to run into a situation where you are simply pushing air from one side of a room to another. As the air moves across the room it builds up more and more humidity from each plant it passes as they transpire. Spend time to place fans in your room where they will adequately mix the air, avoiding the above situation where you are allowing different microclimates in different areas of our room. You don't want to have to be changing feeding scedules to counter localised problems in your grow room, you want every plant to be performing at the same optimal rate.

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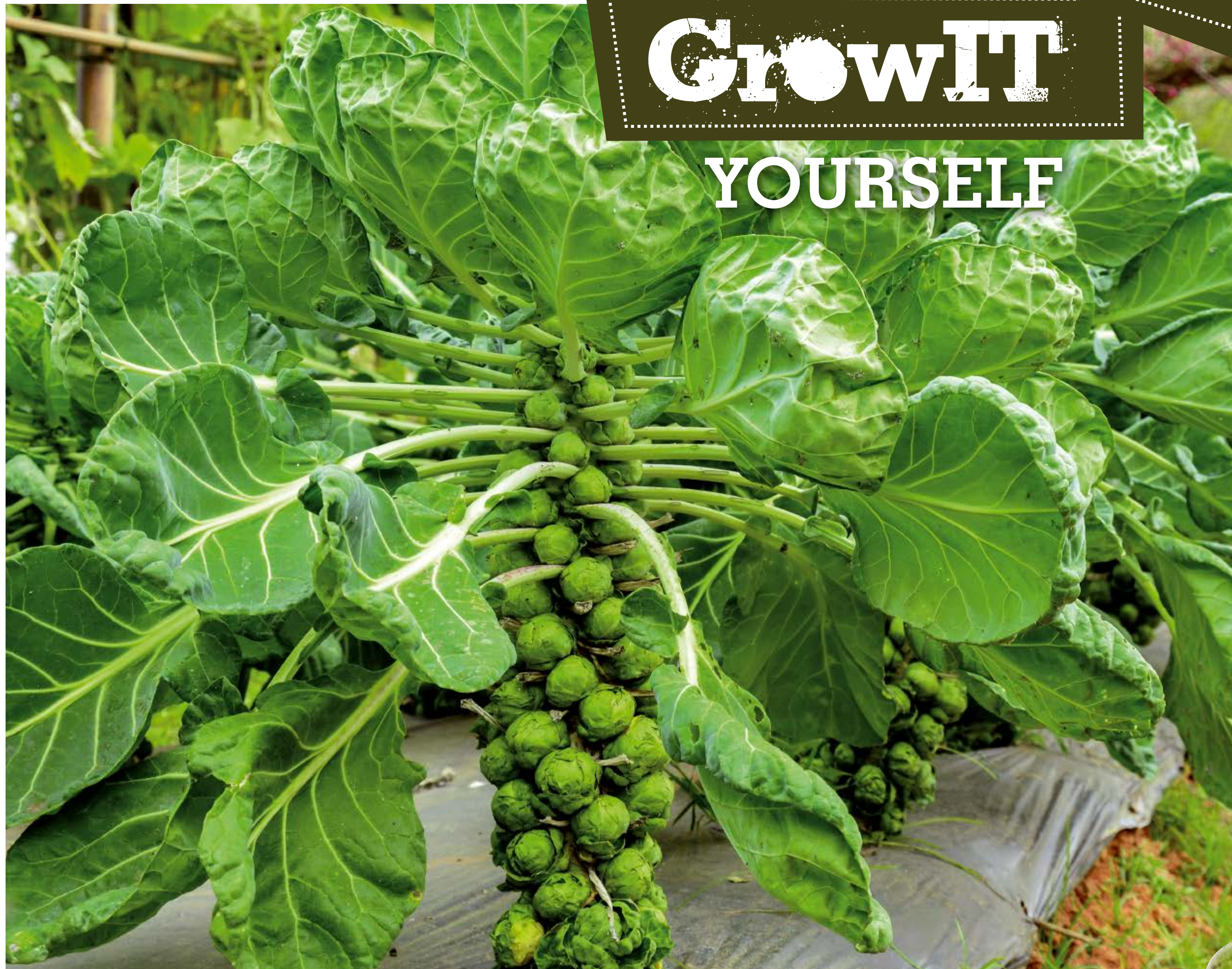
Summary

We have gone through the main factors that effect the foliage of a plant and how that impacts on its transpiration. This is not where the story ends though, it goes much deeper than this. In fact, literally deep into the ground. Balancing the rate of transpiration with what can be provided by the roots is one of the ultimate goals for you as a grower, so always be on guard and monitor the conditions in your room to a degree that would make even the most hardened OCD sufferer proud.•

GrowIT YOURSELF



THE LITTLE CABBAGE THAT COULD

REMEMBER HONEY I SHRUNK THE KIDS? ONCE UPON A TIME THERE WAS A CABBAGE THAT GOT SHRUNK TOO. INSTEAD OF CABBAGE PEOPLE STARTED CALLING HIM SPROUT. AND SINCE HE LIVED IN BRUSSELS, THEY CALLED HIM BRUSSELS SPROUT. A LESSER CABBAGE WOULD HAVE GOTTEN DEPRESSED. NOT OUR BRUSSELS SPROUT. HE'S STILL A HAPPY AND HEALTHY HERO.

By Marco Barneveld, www.braindrain.nu

Once upon a time I was young. Living with grown-ups who would cook me dinner each evening. It wasn't very common in those dark early seventies that parents would ask us kids what we wanted to eat. So a couple of times per year, when the little Brussels sprouts were in season, mum and dad served them. My oh my, did I detest the little f%#@'s.

Brussels sprouts, like spam, canned fish and that weird

gelatinous pate you'd see at our parents' dinner parties, were grown-up food. A punch line food, the kind of thing I associated only with, sometimes not so, thinly veiled threats. 'OK, little man, if you don't eat your Brussels sprouts, you'll....' My mum boiled them to a soft, olive coloured mush. From an early age it was drilled into my brain: Brussels sprouts were something to be choked down. They were what had to be endured if I wanted a bowl of desert or to watch TV in the next two weeks. Gosh, I hated them. Until one sunny day I spied a billy-club-size stalk of fresh-looking sprouts at the farmer's market, brought it home, and began experimenting. Man did I like them, but hey, by then I was a grown-up. And they taste a lot better when sautéed with butter.

Our little hero is a member of the cruciferous family of vegetables, along with broccoli, cauliflower, cabbage, kale, and more. The Brussels sprout has a mysterious and puzzling history. Some writers suggest they were eaten in classical times, as early as the fifth century. According to the English food writer Jane Grigson, they are first mentioned in the city of Brussels's market regulations in 1213. This would suggest they were being grown in the Low Countries at that time. However, not until two centuries later does he appear again, this time on the menus of Burgundian wedding feasts held at the court of Lille. At that time the powerful dukes of Burgundy controlled northern France and most of the Low Countries. After this appearance on the royal table, Brussels sprout vanished again; it seems he never was a very popular vegetable, or perhaps just a very local specialty. Only in the mid-nineteenth century it reached the major league of veggies when French chef Alexis Soyer included Mister sprout in a recipe in his book Modern Housewife. In Victorian England, French chefs were very influential and Brussels sprout caught on in good old England. Just ask any English person which vegetable to serve with the Christmas turkey and you will get the same response: Brussels sprouts. Unfortunately though, they are usually boiled in the sameway as my mums recipe.

Healthy bugger

It's funny that it took our little veggie this long to become popular. Especially because it's a very healthy bugger. We may not be adding him to juices and smoothies just yet, but the Brussels sprout is definitely gaining on king kale as the new side dish du jour on most hipster restaurant menus, and with good reason. These little green gems have a similar nutritional profile to broccoli. Brussels sprouts provide an excellent source of folic acid, vitamins C and K, beta-carotene, fibre and potassium. Due to their high glucosinolate content, they have even proven to be powerfully anti-cancerous in clinical trials.

Glucosinolates are important phytonutrients for our health because they are the chemical starting points for a variety of cancer-protective substances. All cruciferous vegetables contain glucosinolates and have great health benefits for this reason. It's recent research that's made the world realise how especially valuable Brussels sprouts are in this regard. Brussels sprouts are now known to top the list of commonly eaten cruciferous vegetables. Their total glucosinolate content has been shown to be greater than the amount found in mustard greens, turnip greens, cabbage, kale, cauliflower or broccoli. So there you go.

Grow it yourself

That pitch should be sufficient for you to wonder if you should start growing this great veggie. When you do, know that Brussels sprouts grow best in fertile compost-rich, well-drained soil with a pH between 6.5 and 7.5. Avoid planting Brussels sprouts in the same location two years in a row to prevent soil depletion. In regions with heavy rains or sandy soil, supplement the soil with nitrogen.

Plant Brussels sprouts so that they come to harvest in cool weather. Brussels sprouts grow best where the air temperature ranges between 7 °C and 24 °C. Brussels sprouts can tolerate temperatures as low as minus 6 °C but prolonged cold, lack of moisture and too much heat will cause Brussels sprouts to bolt and go directly to seed. Start Brussels sprouts seeds indoors 16 to 20 weeks before the last frost in spring. Set transplants in the garden 12 to 14 weeks before the last frost in spring. In mild-winter regions sow or plant Brussels sprouts in autumn for a late winter or spring harvest. Brussels sprouts will reach maturity 80 to 90 days after transplanting and 100 to 110 days after seeds are sown. Brussels sprouts are not suited for temperatures greater than 27 °C; sustained warm temperatures will leaves Brussels sprouts bitter tasting and may cause their tight cabbage-like heads to open.

Sow Brussels sprouts seeds 0.5 to 0.75 cm deep and 3 cm apart. Set transplants in the garden when they are 4 to 6 weeks old with 4 to 5 true leaves. Space or thin plants 36 to 45 cm apart. Leggy transplants or transplants with crooked stems can be planted up to their first leaves so they won't grow top heavy.

Keep the soil around Brussels sprouts moist; water at the base of plants. Reduce watering as Brussels sprouts approach maturity. Fertilise before planting and again at midseason. Side dress plants with well-aged compost. When you want to grow Brussels sprouts in a container use one that is 12 cm deep or larger. In larger containers, allow 36 to 45 cm between plants. To encourage all of the sprouts on a plant to come to harvest at the same time, pinch off the top terminal bud when the plant is 22 to 30 cm tall or 4 weeks before harvest time. Lower leaves can be removed from the sides of stalks as sprouts develop but make sure to leave the top leaves intact.

Brussels sprouts can be attacked by cutworms, cabbage loopers (preceded by small yellow and white moths), and imported cabbage worms. Control these pests by hand picking them off of plants or by spraying with bacillus thuringiensis. Brussels sprouts are susceptible to yellows, clubroot, and downy mildew. Planting disease-resistant varieties, rotate crops each year, and keep the garden clean of debris to reduce the possibility of disease. Remove and destroy diseased plants immediately.

Brussels sprouts taste best when the buds are small and tight, about 2.5 to 3.5cm in diameter. Sprouts mature from the bottom of the stem upwards unless the growing tip has been pinched out 4 weeks in advance of harvest, in which case all of the sprouts on stem will come to harvest at once. Tender leaves can be eaten as greens or cooked like collards. Cool temperatures will sweeten the flavour of buds coming to maturity.

Got it? When all goes well in your garden, you'll have a nice stack of fresh little cabbages. They will keep in the refrigerator for three to four weeks and can be frozen for up to four months after blanching. Stems loaded with buds in Autumn can be harvested and kept in a cool, dry place for post harvest use. Remove any loose or discoloured outer leaves from stems before storing. Do not wash the buds until you are ready to use them. In this deep-fried sprouts with goat's cheese and black chili flakes recipe for instance. •

R E C I P E

DIEP FRIED SPROUTS

Eat it yourself

Hell yeah, a good deep-fried sprout is a thing of beauty. Deep fry them! Black chili flakes are sweet and not excessively spicy, but can be tricky to find. Use red chili flakes if you can't find any. This is what you need to feed four people:

- **30-35 sprouts, bases trimmed, outer leaves removed**
- **4 tbsp soft goat's cheese**
- **1 tbsp olive oil**
- **¼ tsp grain mustard**
- **A dash of milk**
- **Salt**
- **2 sprigs of parsley**
- **Black chili flakes, or red chili flakes**

Wash the sprouts and dry them thoroughly. Mash the goat's cheese with the olive oil and mustard. Add milk until a thick drizzling consistency is achieved. Season with salt to taste. Fried food takes a lot of seasoning, so make sure that the flavours come through really well. Then, deep-fry those Brussels babies at about 165-170C/330-340F, until the outside few layers of leaves are going golden brown but the inside is still green. Drain and tip on to some kitchen roll and leave (preferably in a warm place) for a minute or two. Season with fine salt. While the sprouts are resting, wash and chop the parsley, arrange the sprouts on a big plate, drizzle with the goat's cheese dressing and sprinkle with chili flakes and the parsley. Oh my, you are in for a treat!

Yummmm.

Questions & Answers

We receive a lot of questions about growing. Of course, our researchers are more than happy to answer them! Just go to the contact page on our website, www.canna-uk.com, to submit your question.

Question

I have a Wilma grow system and am not sure if I need clay pebbles with CANNA AQUA nutrients or coco coir with CANNA COCO A&B nutrients? With both, how often should I change the water?

Answer

CANNA AQUA Clay Pebbles in combination with CANNA AQUA Vega and Flores are the correct nutrients to recommend for a recirculating system such as the Wilma. We recommend that you refresh the tank every 7-10 days. However, if you are using hard water (EC 0.4-0.8+) then you may have to change sooner to avoid a build up of calcium, magnesium and other elements that may be present in the water such as sodium and chloride. In general we only recommend recirculating systems to be used with soft water.

We don't usually recommend the use of Coco in a recirculating system because the coco substrate will absorb calcium and magnesium from the base feed and will then release potassium and phophorus in return. In this way the wrong ratio will develop and the EC in the tank will increase. The only way to prevent that problem is to change the water quite often. However, you will throw away at least 50% of the nutrient solution and that is not the goal of recirculating system.
If you wish to use coco then it is better that you choose a run to waste system watering to a run off of between 10-30%.

Question

I am looking at the CANNA grow schedule and I dont understand why it says 12 hours of lights per day next to Vegetative phase II. Why isnt the veg and flower phase completely separate?

Answer

There is a difference between the flowering phase and the generative phase.
The vegetative and flowering generative phases are indeed seperate. The moment you change the light cycle period from 18 hours to 12 hours then you start counting the flowering phase. But the plants are not flowering yet. The generative phase starts from the moment you see the first flower.
Vegetative phase II is the period in which the plant is still growing but by putting it in a 12 hour cycle it starts to make the flower hormone also. So, vegetative phase II is actually in the Flowering phase and you can see this in the grow guide.

Question

I get a bit confused regarding when to start and stop giving CANNA START and CANNA RHIZOTONIC. Please could you kindly advise further?

Answer

CANNA RHIZOTONIC is given everytime you give water but the dose differs with the stage of the plant. In the beginning you wet your substrate with only RHIZOTONIC (4 mL/L).
Then place your seed in the substrate for germinating. When you next need to water you do so using RHIZOTONIC at 2 mL/L.

After germination and when the first real leaves appear (not the cotyldons) you begin to give START with an EC level from 0,8- 1,2 and continue with RHIZOTONIC at 2 mL/L. After about 2 weeks when you transplant the plant to its final substrate you then change the nutrients from START, to the normal A & B versions.
Later on when you see the first flowers, you can reduce the dose of RHIZOTONIC to 0.5 mL/L.

Question

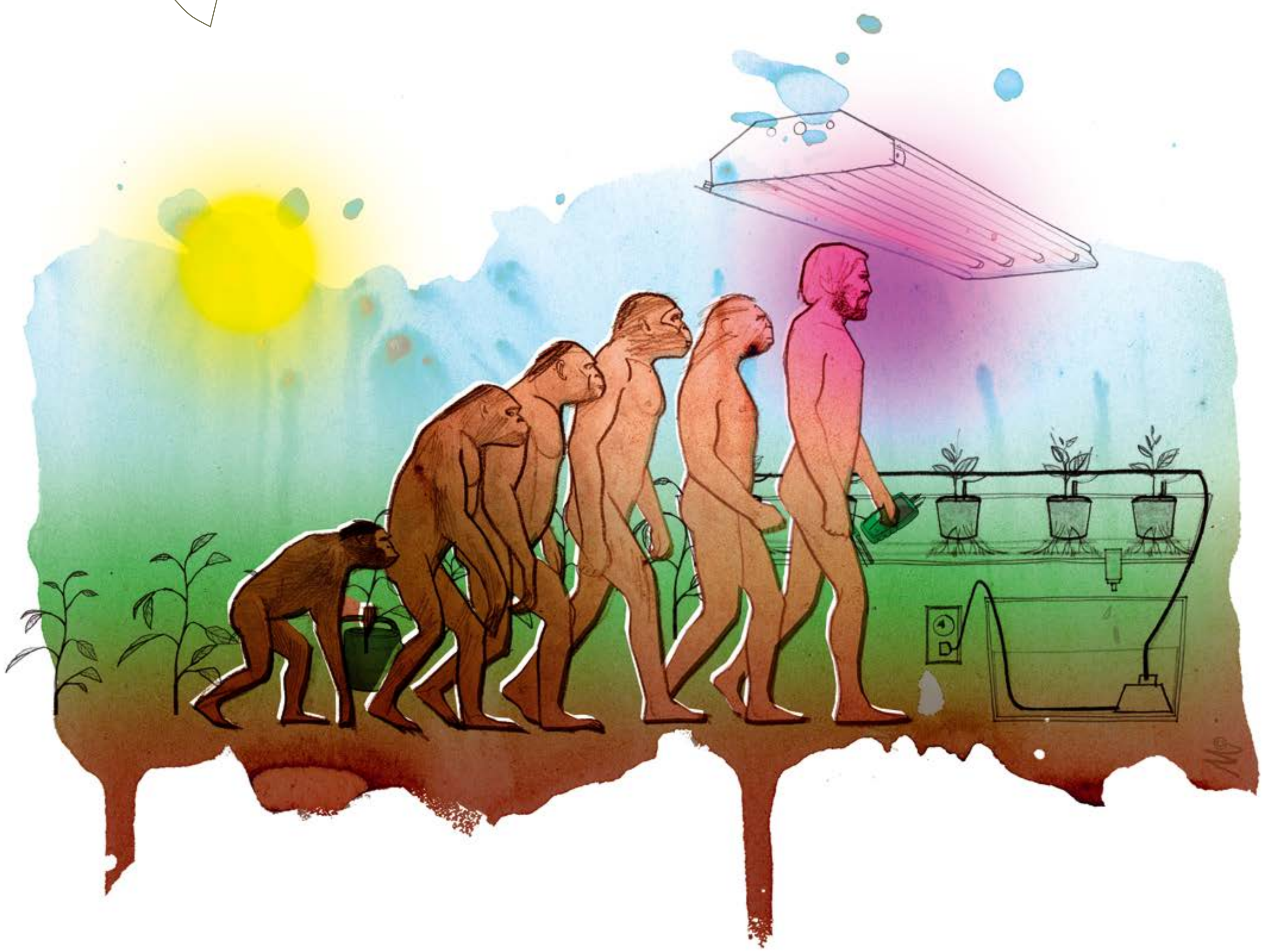
I have 200 CANNA CoGr slabs in my grow room. I want to check the EC and pH levels, how often and how many slabs must I check? If using the 1:1.5 extraction method it can take some time, can I just take a sample from the run-off?

Answer

Whilst testing run-off water is nice and easy to do, it does not provide an accurate result. The 1:1.5 extraction is the best/most accurate method. In general we recommend that you check at least 5%, so in your case that's a minimum of 10 slabs.
When doing the analysis, treat each test separately (do not mix). So, you take 10 samples, do 10 tests from which you can make an average.
The best option would be to check daily but this can take time so in general once a week should be enough to enable you to see a pattern/change in EC and pH.

Grower's interview
Dean Finley

In the first installment of our new feature ' Grower's Interview ', we have a chin-wag with Dean Finley. He is a lovely chap from the UK, with a large passion for growing. He has been a keen gardener for many moons and like many others, progressed more and more down the hydroponic route as time (and necessity) has passed. We will be catching up with Dean again in a future issue to see exactly how his garden grows, but before then, we wanted to pick his brains so we can all get to know him a little better.



So then Monsieur Finley, how long have you been greenfingered ?

Well, the journey started way back in the good old school days when I used to volunteer on an open farm helping to give tours to inner city kids that had no idea where their food came from.

We also had an on-site nursery for a little extra income selling wild flower and herb plants to the locals and vegetable plants to give to the kids and families to take home and grow their own. It was shocking to see how many kids had no idea of the origins of their food or horticulture.

Where and when did it all actually start ?

Around ten years ago I was at a customer's site that specialised in bio-research mainly involving South American rainforest plants and their application in the pharmaceutical industry. Not only a fascinating subject, I also found out the price they were paying for very poor plants being shipped half way around the world so after a quick chat it was 'game-on' with a buyer waiting in the wings. The next step was linking up with seed suppliers all around the world and months of practicing to get it just right - and a lot of practicing was needed!

What led you down the yellow brick road, specifically into Chilli Land?

I spent around 5 years traveling around Southeast Asia and the humble chilli is the back bone of day to day eating! They are everywhere from ice cream, cakes and in virtually every main meal. To think most people believe the chilli belongs in a nasty curry after a Saturday night is quite scary and shows a serious need for some chilli education. So with my seed suppliers around the world I had easy access to some of the worlds finest and a huge range of flavours to explore.

However, the big breakthrough was when the tropical plant trials ended and the chilli world seemed to explode into life, almost going from a back yard past time to a multi-million pound industry overnight. Festivals popped up everywhere, artisan sauce makers rubbed shoulders with top chefs and everyone fought for a piece of the chilli action. I just happened to be in the right place at the right time with a bag full of seed from around the world.

What got you started on using hydroponic practices rather than traditional method?

Precision and control! The tropical plants required a very accurate pH, temperature and anything up to 6 months to propagate so nothing could be left to chance. Waiting 6 months to find out it had gone wrong was a bit depressing to say the least. So hydroponic substrates, feeds and additives were an obvious choice as they removed any element of chance. Chillis are not as intolerant but they do thrive on consistency while propagating and gradual feed changes when growing to get the best results.

Do/did you buy systems or equipment to fit around your practices or adapt your practices around new systems?

A peek in my garage would answer that one for you! Over the years I think I have used or built every type of hydroponic system ever thought of and even some hybrids that don't exist yet. Every time I found they all had their individual draw backs so I normally bend them to my will (and grow space). It has to be right for what and where you're growing!

What do you like about hydroponic practices?

The results! With minimal knowledge and a bit of patience you can achieve almost unbelievable results that would astound most hardened traditional growers (a 9 year old won best in class with a leek at the Scottish nationals grown using Autopots this year). Manufacturers are

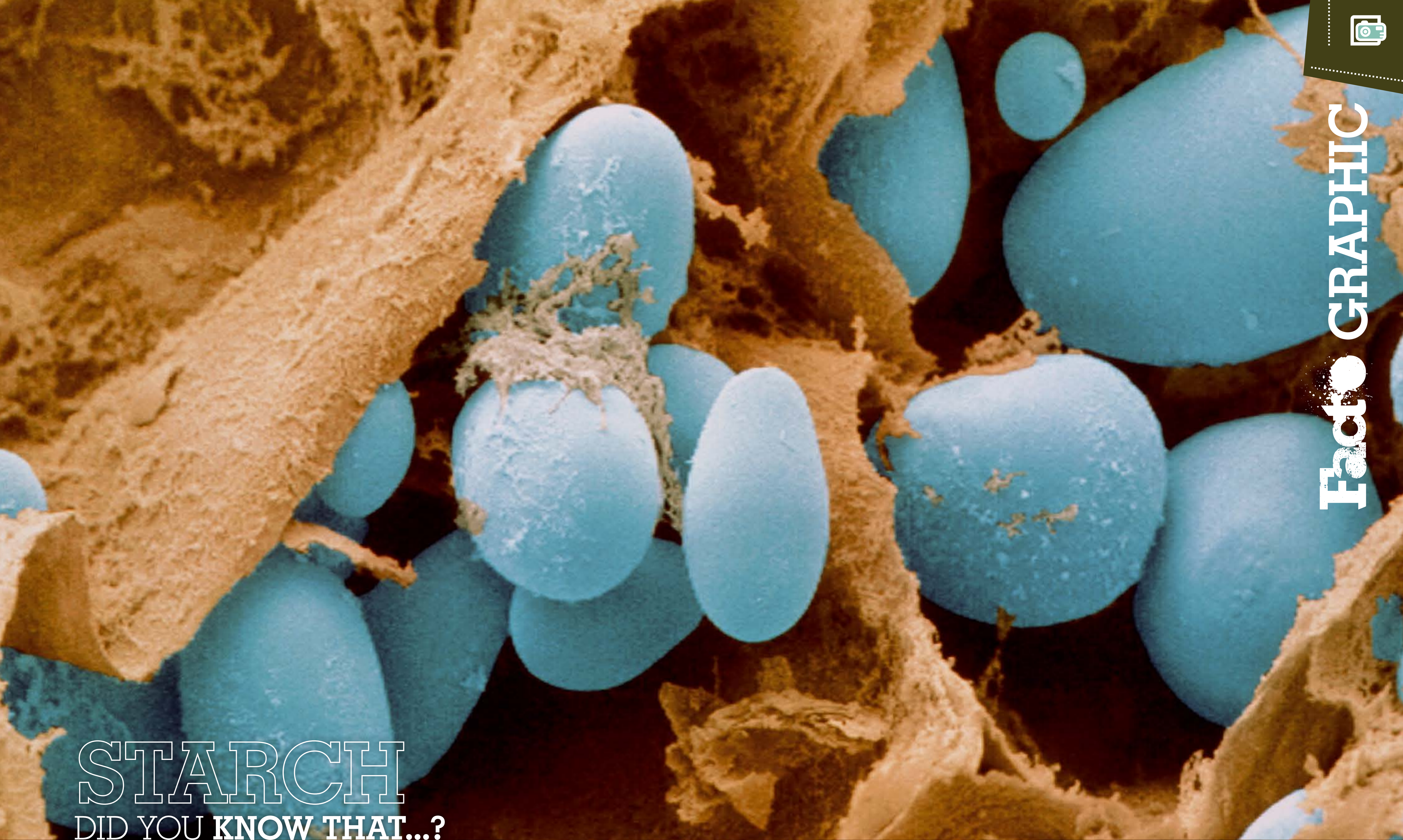
starting to produce some fantastic products from media, feeds and additives, even the humble organics are starting to gain a good following with the discerning veg grower.

What don't you like?

Shop staff! Well some of them? They need to remember that not everybody is an expert and for most hobby growers its a very daunting and alien subject! Manufacturers are bending over backwards to spread the word in the horticultural world with shows and talks so the shops should be embracing this new breed and welcoming them into their shops. It's a very large market waiting in the wings.

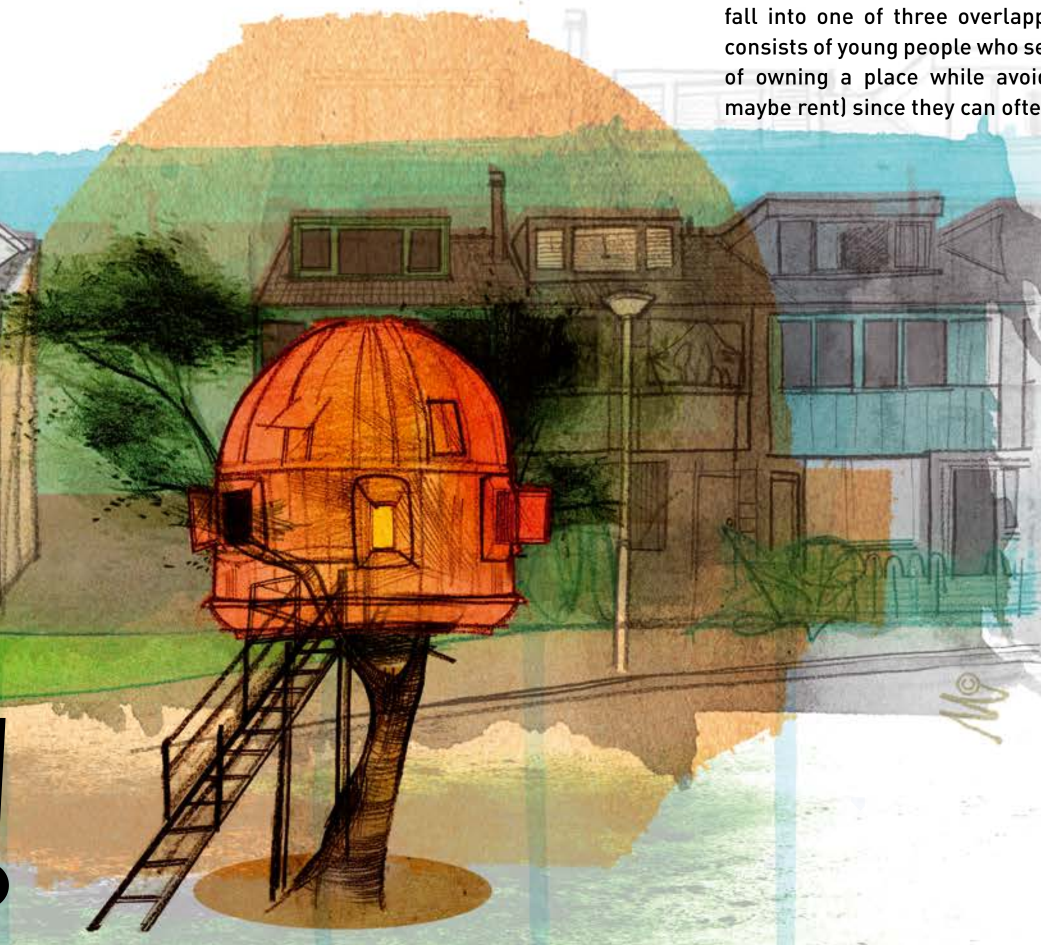
For you personally,what do you think the biggest practical advantage of using hydroponic methods is?

Its easy, neat and tidy with a fantastic crop just waiting! I have taught growers from 9-90 so there is no excuse not to have a go. All you need to do is choose a system that fits your space, add some quality media , feed and sit back a enjoy the fruits of your labour.•



STARCH
DID YOU **KNOW THAT...?**

- What you see on this image is potato starch.
- Starch is manufactured by green plants during the process of photosynthesis.
- That starch is a heterogeneous material composed of the glucose polymers, amylose and amylopectin
- Starch is synthesised from sucrose, a sugar formed in the leaves during photosynthesis and transported to the tuber via the phloem.
- It is used as a store of energy for the later development of buds on the surface of the plant.
- That starch is made up of long chains of glucose molecules. The chains can be branched.
- Starch is compact, forms an approximately spherical shape and is insoluble.
- Starch is indicated by testing with iodine. A blue-black colour is given. Since starch is made up of two types of polymers, the molecular weight and structure depends on the source and the type of polymer it comes from.
- Since starch decomposes in water, there is no melting, boiling point and density.
- Starch begins to gelatinise between 60 and 70 degrees Celsius.
- Starch is insoluble in cold water and alcohol.
- Starch paste was used by the ancient Egyptians to cement strips of papyrus stems together for use as writing paper as early as 4000 B.C.
- Chinese paper documents of about 312 AD were coated with a starch sizing to provide resistance to ink penetration.
- Starch was used in northern Europe to stiffen linen, as early as the 14th century.
- Coloured and uncoloured starches were used as cosmetics. Blue starch was used by the Puritans until its use was banned by Queen Elizabeth in 1596
- Yellow starch was fashionable during the middle ages until a female prisoner wearing a bright yellow-starched ruffle was publicly executed.



DAMN YOUR HOUSE **IS** TINY!

Not so long ago, the exclamation used as the headline of this article had quite a bad connotation. You had a tiny house therefore you were poor and pitiful. Nowadays, it is meant as a big compliment. At least, when you are part of the Tiny House Movement.

By Marco Barneveld, www.braindrain.nu

Bigger is better. For ages this was the maxim when it came to housing: the poor lived in small houses. Once that ship with green gold came sailing in and poverty was a thing of the past, the small home was quickly exchanged for a bigger one. The better someone was doing in society, the bigger the mansion. The mightiest and wealthiest owned giant castles and palaces. The Tiny House Movement killed that maxim.
So what exactly is the Tiny House Movement? To keep it short (pun intended) it's a social movement where people are drastically downsizing the space they live in. It has been around for years but has recently started to gain a big reputation fuelled by the media worldwide.

There is no wonder why, when you look at the picture of all the wondrous and most of the time gorgeous and innovative tiny houses, the lure is tempting: living free and happy in your own tiny palace. And so the movement grows. There are tiny house conferences, a small house society and more and more people choosing to live in tiny homes each year.

But why? Well, an urge to be free for one. Free from the millstone of debt that hangs heavily around the neck of most homeowners. For example, the average American home is approximately 241 square metres and the typical tiny house is 10-20 square metres. For most Americans one third to half of their income is dedicated to the roof over their heads. The average house takes 15 years of working just to pay it off. If you put all you earn in it, that is. However, people need to eat too, amongst other things. Due to this 76% of Americans are living from paycheck to paycheck. Tiny Houses come in all shapes, sizes and forms, but they enable simpler living in smaller, more efficient and affordable spaces.
People who live in tiny houses (or aspire to) appear to fall into one of three overlapping categories. The first consists of young people who see a tiny house as a means of owning a place while avoiding property taxes (and maybe rent) since they can often find places to park their house for free (if the house is on wheels). The second group includes older men and women who have either sold, or walked away from a house they couldn't afford. A subset of this group is retired couples whose children are gone, and who want to live a more simple life.

Tiny houses vary in shape and size, some are built on trailers so they can move around, and others are stationed on property. They are usually able to encompass a bathroom, kitchen, living area and a sleeping loft. The different designs and layouts vary from house to house, but creativity is seen throughout. There are tiny Victorian houses, foldable houses and tiny boathouses. If you have a vision you can create it. There are even companies specialised in creating tiny homes. It seems that followers of the Tiny House Movement choose a 'small but impressive' theme. Everything from the designs of the homes, to their general location seem impressive when you dive deeper into this sympathetic phenomenon.

Environmental and financial concerns are a few of the factors that are driving people to live in tiny houses. They leave a smaller carbon footprint than a typical home, and cost a fraction to maintain. Owners of tiny houses say that focusing on a simpler way of living and reducing their financial burdens have positively impacted their lives, in a big way.
Tiny house dwellers often believe that there is a conspiracy among homebuilders and banks to make houses that are bigger than what people need or can pay for. The *Times* recently published a piece noting that larger houses have become difficult to sell, because more people want smaller houses, closer to where they work. Are the people of the Tiny Home Movement the trendsetters of an epochal, cyclical change? Will houses become smaller all over the world? Will bigger never be better again when people think that small is best? Only time will tell. However one thing is certain, the smaller the house, the harder it is to loose your keys. That's something too! •

Figure 5: Tiny homes come in all shapes and sizes and are as unique as the people living inside them.'

Pests & DISEASES

In the previous article we explained a bit about parasitic wasps in general. In this article we will look at some of the more common and most used parasitic wasps for the control of aphids (also known as green fly) in more detail.

PART 2 PARASITIC WASPS

Aphidius species

The wasp genus *Aphidius* is a large group containing numerous species, all of which attack aphids and provide natural control of aphids in gardens, commercial fields, and urban landscapes. The species discussed here are commercially available, and are generally used in greenhouses. *Aphidius* are small braconid wasps. Females lay eggs singularly in aphid nymphs. The wasp larvae consume the aphids from inside. As the larvae mature and the aphids are killed, the aphids turn into mummies. After the larvae pupate, each adult wasp emerges through an exit hole cut in the mummy. In addition to killing aphids directly, mechanical disturbance of aphid colonies by the searching behaviour of the adult wasps causes many aphids to fall off the plants and die.

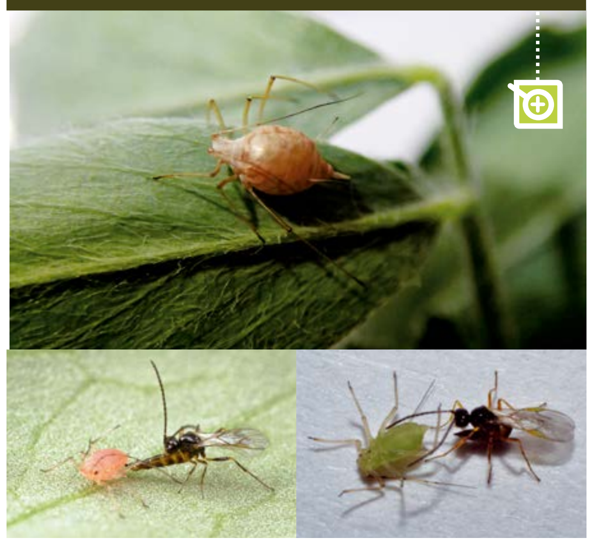
TIP!!: Adult wasps are attracted to the colour yellow, so yellow sticky cards should be removed before releases are made.

Aphidius matricariae, are a 3mm long, black wasp from Europe. It is one of the most common and effective parasites of the green peach aphid. Females lay 50-150 eggs in aphid nymphs of all sizes. The aphids are killed in about 7-10 days, the aphids turn into a smooth, shiny, and light brown to silvery-gold mummy. This wasp does not diapause under winter greenhouse conditions as readily as some natural enemies so it can be an important part of an aphid biological control program from fall through to early spring. Native A. matricariae entering the greenhouse from outside sometimes become established and provide effective control.

Aphidius colemani is a cosmopolitan species, meaning it occurs in most parts of the world. It reproduces well on cotton aphid, green peach aphid, and other species, but not on potato or foxglove aphid. It looks similar to A. matricariae, but the females lay more eggs. An average of 388 over their 4-5 day life span. A. colemani is a good candidate for aphid biological control in greenhouses because of its high reproductive potential, short development time and ability to parasitise several species of aphids, especially cotton aphid, melon aphid and green peach aphid. Their disadvantage is that they are less effective at higher temperatures (above 30ºC)

Aphidius ervi is another cosmopolitan species that parasitises numerous aphid species in many different crops. In greenhouses, the black adults parasitise particularly potato aphid and foxglove aphid, which turn into a grey or brown mummy. A. ervi is most effective when released before aphid populations build up. Disadvantage is that they are less effective at higher temperatures (above 30ºC)

Figure 6: Different species of aphid have different predator wasps associated with them. However, the mummified cask of the aphid is the end result of them all.



Aphelinus abdominalis

Aphelinus abdominalis is a parasitoid wasp which attacks over 200 species of aphids. It is primarily a parasitoid of larger aphids (Foxglove, Potato Aphid and Green Peach Aphid) but is also a significant predator.

Aphelinus are about 3mm long and black with a yellowish-brown abdomen. The legs and antennae are relatively short. Although winged, they are not strong fliers so needs to be placed near aphid colonies for maximum efficacy.

The female lays eggs singularly into mid age nymphal stages of aphids. The egg hatches after 2-3 days and the larva feeds on the aphid without immediately killing it. During pupation it transforms the aphid into a distinctive black 'mummy'. Direct killing through predatory feeding on non-parasitised younger nymphs, is also significant. Aphelinus has a relatively long life and oviposition period of several weeks and can lay 5-10 eggs/day. Aphelinus is better able to withstand high temperatures than Aphidius species.

Aphidoletes aphidimyza

Contrary to some other gall midge species, *Aphidoletes aphidimyza*, or aphid midge, does not cause damage by forming galls on leaves. The adults feed on pollen and nectar. A female has an excellent searching ability for aphid hot spots where she lays more than hundred eggs. The larvae are voracious predators preferring almost all aphid species.

Adult aphid midges are small (2-3 mm), delicate, mosquito-like flies with long, dangling legs and long antennae. Eggs are oval, minute (about 0.1 mm by 0.3 mm), and orange. The larvae, which look like orange maggots, are tiny, growing through three instars from minute to 2-3 mm. The midge larva paralyses each aphid by attacking its leg joints and then sucks it dry, leaving a blackened, collapsed aphid attached to the leaf. One larva needs a minimum of 7 aphids in order to complete the life cycle, but it may eat as many as 80. In addition, the larvae kill more aphids than they consume. The larvae pupate in the soil.•

IMPORTANT!

Only use products that are permitted in your country/state and crop. Check local registration requirements. CANNA cannot be held liable for unauthorised use.

PART 2 PLANT ENVIRONMENT

BALANCING ABOVE AND BELOW

EVERYONE FOCUSSES ON THE VISIBLE DON'T THEY? ALWAYS CONCENTRATING ON THE THING THAT IS IMMEDIATELY OBVIOUS AND NEGLECTING OTHER AREAS THAT AREN'T NECESSARILY AS EXCITING, BUT STILL EQUALLY JUST AS IMPORTANT. FOR EXAMPLE, THE INCREDULOUS ELECTION OF A FARCICAL PRESIDENT WILL OFTEN HAVE PEOPLE QUESTIONING WHAT IT IS THAT THE VOTING MAJORITY SAW IN THE APPEAL OF SUCH A CHARACTER. "HOW THE BLAZES DID THAT *COUGH* GUY GET ELECTED" YOU MIGHT ASK YOURSELF. WHILE THE IDENTITY AND PERSONA OF THE ELECT DOES OBVIOULSY PLAY A LARGE PART IN THE RESULT, IT WOULD BE WISER TO FOCUS ON THE SOCIAL AND ECONOMIC CONDITIONS IN PLACE THAT HAVE LED TO THIS SITUATION IN THE FIRST PLACE, FROM THE GRASS ROOT UPWARDS.

By NICO HILL

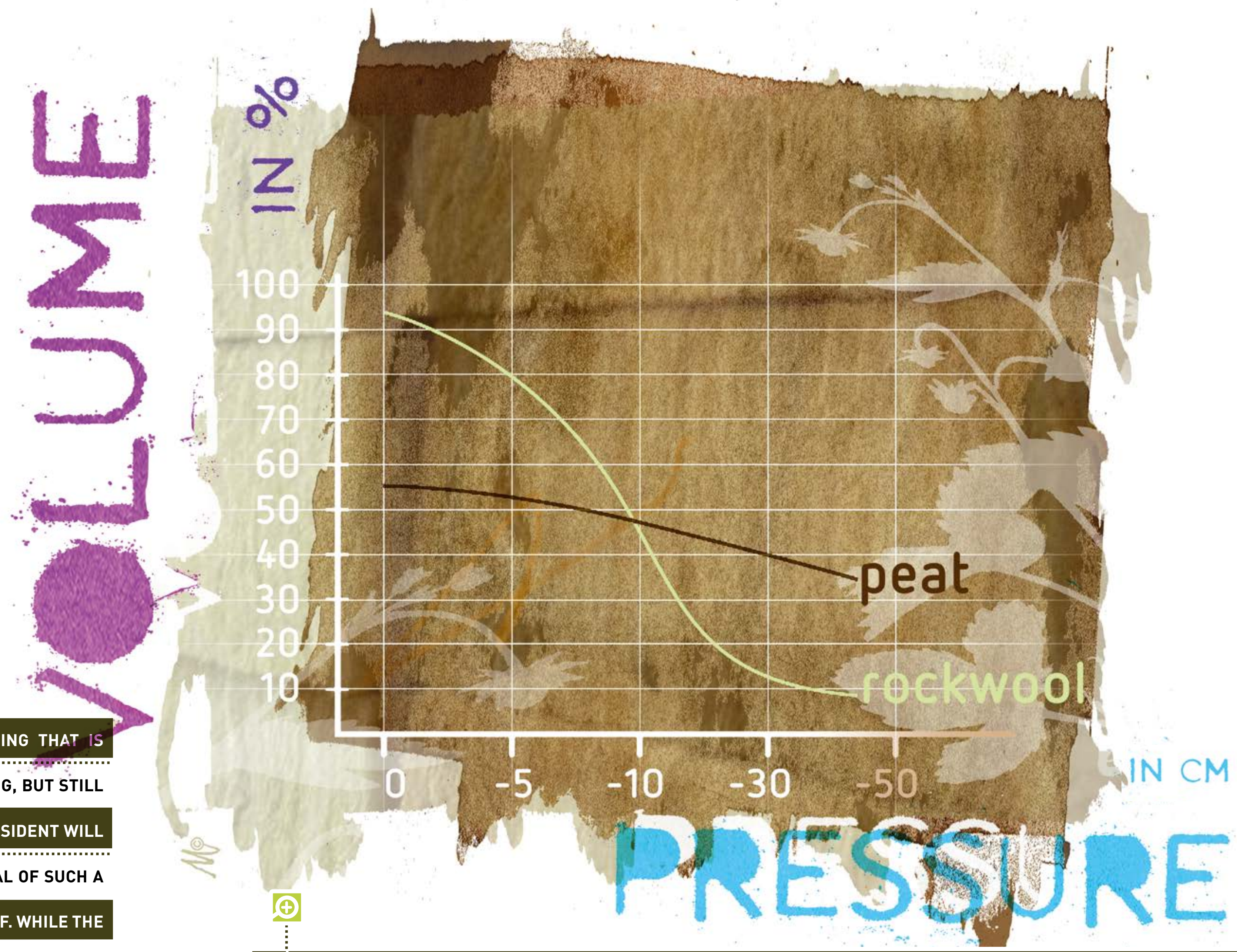


Figure 7: The above graph shows the differences in how the two mediums (rockwool and soil) hold onto and release water. You can see that volume per volume, rockwool can hold more water than soil, and also less pressure is needed to get an equivalent amount of water released from the media.

Seamless political links aside, focusing on the roots upwards seems an almost backwards way for some growers to conduct their business. More often than not, the same amount of water will be fed to plants, day after day, following a strict E.C and pH schedule to the 'T', When I say strict schedule, it's sometimes more a case of, "I just give 'em each a cola bottle full of water with a capful of part A in through veg. Then switch to part 'B' for bloom". Unfortunately, you're going to need to be a bit more savvy than that to properley cater for your root's needs.

Underground Resistance

It is not just the things happening above ground that can influence the opening and closing of stomata. Conditions in the root zone can also influence whether the stomata can remain wide open, or shut themselves off from the world like little hermits. If the conditions in the substrate get to the point where root pressure is less than that of the demands of the shoots, then they will begin to close themselves off to compensate for this. Closed stomata means no photosynthesis, which means no growth! Obviously, this is something that we want to avoid. So what is it that affects root pressure? Well let's have a little look shall we?

Moisture Content

This one is easy enough to understand on the face of it. In layman's terms, is there enough water in the substrate? Sounds easy right? Nothing is easy in life my friend. Exactly when and how much you should actually be watering is possibly one of the trickiest things to get right. Different substrates need to be looked at and treated accordingly, as they all have different water holding properties. On top of that, different plants all have different water requirements throughout different stages of their life cycle. All of this combined with seasonal fluctuations in the environment impacting on water requirements leads to no one-rule being correct. Brace yourself: you will need to use your head and constantly adjust your irrigation strategy to ensure your moisture content is adequate for optimal growth.

PLANT ENVIRONMENT

At the same time you need to take into account whether you want to steer your plant vegetatively or generatively. Irrigating so your substrate is on the wetter side of the curve will steer your plants towards vegetative growth whereas a dryer substrate will encourage generative growth. However, you obviously don't want to run the roots so dry that there is no root pressure, as all the available water has gone. Similarly, a 100% saturation will mean a low force is needed to take up the water, but at the same time the oxygen content is much more likely to drop to detrimental levels, not only lowering root pressure, but also leading to issues with anaerobic diseases.

Different Substrates

Each substrate has different water holding capacity and retention property. The illustrated pressure curve shows how Rockwool and soil both act going from wet to 'dry'. Essentially It shows how much pressure (or force) is needed to take the water from the substrate, from its wettest point, to its dryest point. The first thing you will notice is that the soil line is very shallow, while the Rockwool curve is very steep. So what does this mean?
Let's look at it from the point of having 10L of Rockwool as a substrate compared to 10L of soil as a substrate. With Rockwool you can see that a lot higher percentage of the substrate's volume can contain water. From 94% down to 10% to be precise, so essentially 85% of a 10L Rockwool block will be water. That's 8.5 Litres compared to 1.5 Litres when looking at the peat line. Peat is fully saturated at 55% and 'dry' at 40%, so 15% of the 10 litre total volume is available as water. This means there is a lot higher buffer of water in Rockwool, meaning that it can give a lot more room for steering plants with either a wetter or dryer substrate. Or, to put it another way, you need more L/m2 of Peat compared to rockwool. Example: 4X 8.5L slabs of rockwool = 35L water/m^{2}. Compare this to 200L of peat = 30L water/m^2). This is why you need a larger volume of media when using peat compared to rockwool. (16/m^2 x 12L pot is 192L of peat)

It is also a lot easier for the plants to take an amount of water from Rockwool. The steepness of the curve means that less force is needed to take the same volume of water compared to that of soil. So to get the same amount from soil, the plant must work harder for it. Relatively, this means more energy is allocated to the roots and less energy can be allocated to plant growth. This is just one of the reasons why growing hydroponically has the potential for higher yields and faster growth over that of conventional soil growing.

EC: How to make water dry

I beg your pardon? Making water dry? Firstly, what does this mean and secondly, why the expletive would you want to do that? In answer to the first question, it is entirely down to the presence of salts. Fertiliser salts to be precise, but more to do with the physical nature of salts themselves and what they do to water. Science fact: Salt attracts water. So the higher the EC of a substrate, the higher the amount of salts it contains. The more salts there are attracting the water, the more energy is needed by the plant to take the water away from these salts. Plants don't feel wet and dry like we do as humans. More energy needed for the roots to either take the water from the substrate, or away from the salts on the substrate is essentially the same thing to them: it just 'feels dryer'.
Obviously plants need these salts in a hydroponic environment; to provide the main nutritional requirements for the plants is their most obvious task, but the effect the salts have is also used to help steer the plant towards generative growth. Helping to imitate the dry season towards the later half of the flowering cycle (before the flushing period) with a high EC (usually from additional PK additives) is something that can be of great benefit to a plant, to properly finish off a harvest.

Oxygen levels/Temp of substrate

Roots need oxygen available in the solution in the substrate to perform and function correctly. At the same time they also need it to be a nice warm temperature, so their metabolic processes aren't stiffled through exposure to too cold a temperature. These two variables are linked in a similar way to that of temperature and humidity in the air. As the temperature of a solution rises, the solubility of the oxygen in it decreases. So the colder it is, the easier it is to achieve higher levels of Dissolved Oxygen (DO) in the solution However, don't just go as cold as possible you need a decent temperature to keep the metabolic rate of your roots at the optimum level, so balancing the temperature to account for these two variables is key.

Ideally, aim for the temperature of your nutrient solution to be between 18 and 22 degrees Celcius. This should then take into account for the warmer temperatures you will likely see in the actual substrate in your pot, which you want to maitain between 20 and 24 degrees celcius. Air pumps or stones are not advisable for trying to increase the DO of your reservoir (because they are fixed by the water temperature), as they will likely cause fluctuations with your pH levels.

Balancing above and below - Root Pressure vs Transpiration

Differences in the amount that a plant transpires via the stomata, compared to a continual supply of water from the roots can and will manifest itself in differences/changes in growth. These differences in growth patterns are (for once) something that we as humans can actually see and give us a good indication where the balance of root pressure against transpiration lies, and what we could do to address any imbalance this growth has shown us.

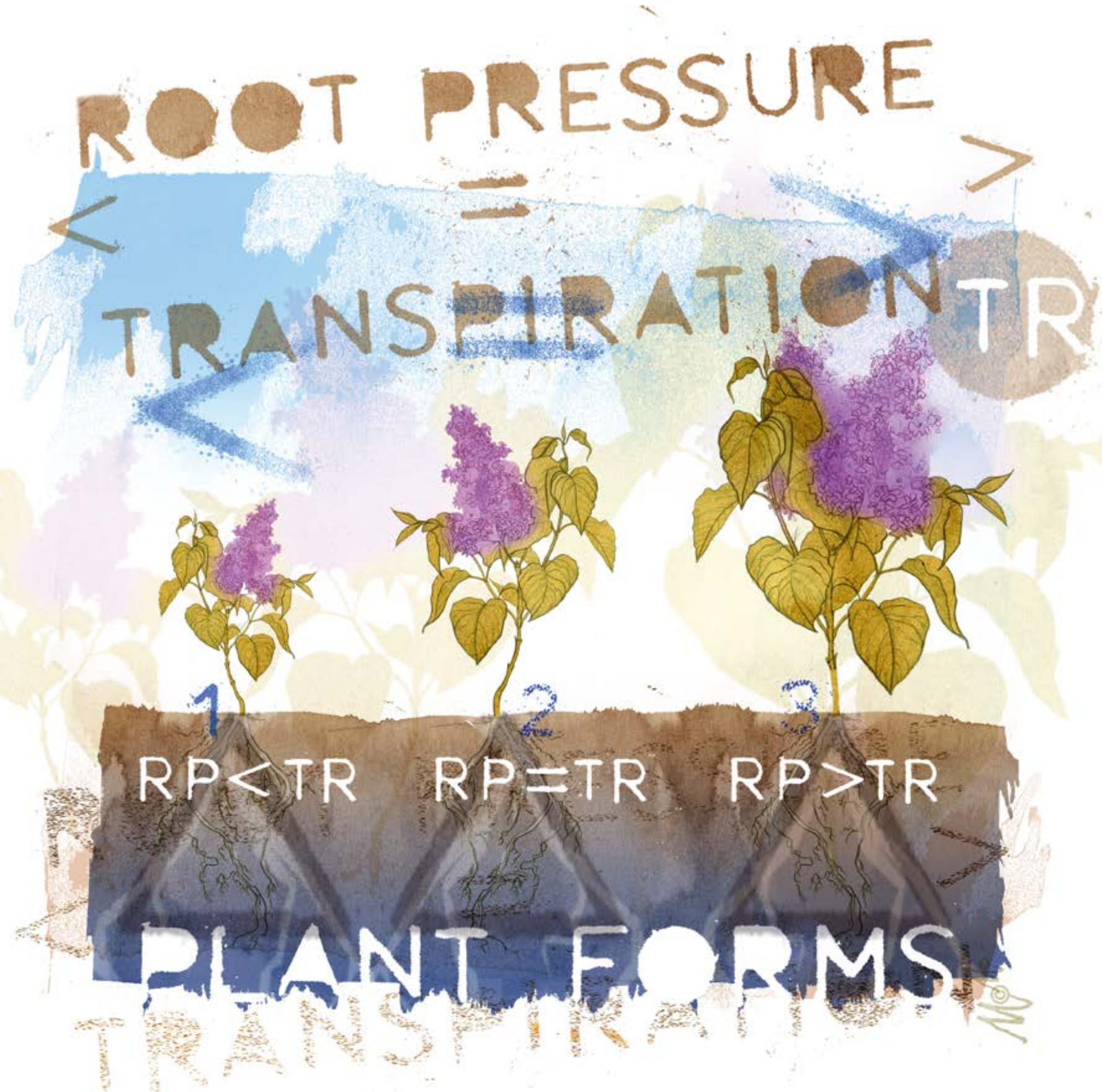


Figure 8: Plants respond in different ways depending on the changes in the amount of water supplied by the roots, compared to the amount of water transpired by the stomata. These differences will result in a change in the plants form so you can easily recognise what situation your plant is in.

Root pressure < Transpiration

This is the plant on the left of the three. It can either be that not enough water is being supplied by the roots or that transpiration is demanding more than can be supplied from the roots. If your plant is in this sort of situation, then you will see a difference in the form of your plant. Key indicators to look out for are as follows.

Compact Growth

High amount of water used in transipration limiting amount for storage and growth, results in a squater, more compact plant with shorter inter-nodal difference.

Smaller leaves

Leaves keep a smaller surface area to limit exposure to heat and therefore transpiration requirements.

Curled Leaves

In an effort to reduce the surface area of the leaf exposed to extreme conditions(such as heat from the light), the leaf will curl itself upwards

Early autumn colouring

Plants unable to cool itself adequately due to either low root pressure or high transpiration. Being unable to cool leads to buning of the leaves, when this starts, the plant draws the remaining energy from the leaf to redistribute around the plant, causing the leaf to yellow and eventually drop off.

Early ripening

Pretty much all natural processes happen faster at higher temperatures.
Ripeining is no stranger to this rule. With a limited water supply and a high transpiration, the plant will be unable to cool itself adequately.
This higher temperature will result in a faster, sometimes premature ripening process.

ROOT PRESSURE PROBLEM	ROOT PRESSURE SOLUTION	TRANSPIRATION PROBLEM	TRANSPIRATION SOLUTION
Moisture content is too low	Increase amount and/or frequency of irrigations	Temperature too high	Decrease light intensity, increase air exchange
Oxygen level too low 1) High water/substrate temp. 2) Overwatering	1) Lower the substrate temp. 2) Decrease amount of waterings	RH too low	Increase humidity Lower temperature
Substrate temperature too low	Increase temp of substrate	Air exchange too little for amount of heat generated by lights	Lower temperature theshold on extract fan controller or upgrade extract fans.
EC of substrate too high	Decrease strength of nutrient solution. Possible flush	Air flow too high	Manouver fans to create optimal uniform environment.

Diagram 1: Here are a few typical problems associated with a higher root pressure compared to transpiration, and how you can combat them.

Root pressure > Transpiration.

This is the plant on the right of the three. This can either be from an over efficient root system (For example, a large mass with a high(ish) temperautre, low EC and a high moisture and oxygen content) or from the shoots of the plant not being able to transpire correctly (from too high a humidity, for example). Whatever the reasons may be, the result is that there is more water being 'pressed' into your plant than is being released. This water is stored in your plant and also causes its form to change. You will notice your plant's growth respond in a few potential ways:

PLANT ENVIRONMENT

Long/Stretched inter-nodal distance:

There is more water being pushed into the plant than is being used, but it still has to go somewhere right? This extra water ends up causing the inter-nodal distances to increase, so you will notice your plants becoming taller and stretchier than usual.

Big Leaves

Similar to the result of a larger inter-nodal distance, larger than normal leaves will also manifest themselves if you have a greater amount of root pressure compared to transpiration rates.

Fluffy/loose flowers

This water is not only being pressed into the stems and leaves, but also the flowers too, so they will become big and fluffy, but not with the usual density you would be accustomed to. They might look good on the plant but will sooon shrink down during the drying process.

Guttation

In extreme situations, as no water can get out of the stomata, it is literally forced out through pores on the tips of the leaves. You will see beads of water will collect at leaf tips, looking very much like dew drops.

Botrytis

In the presence of all of this extra water, there is one disease in particular that can rear its ugly head. Having a high root pressure, combined with full flowers towards the end of the generative period, is the ideal conditions for botryitis to take hold. Here are a few typical causes associated with this scenario and how you could combat them: *(See diagram 2 on the bottom of this page>)*

Summary

Of all the information to take from this article, simply knowing how your plant grows is crucial to achieving success. If you can spot the differences in growth-patterns that changes in the environment can bring, then you will be all the wiser when it comes to tackling any problems that rear their ugly head.

You will soon see that a plants' form and shape is like some sort of esoteric language and building your fluency will allow you to meet your plants needs to a highly efficient degree. Keep all of these steering factors in mind when you are tinkering in your grow room and ultimately, your fingers will become the greenest in your community. •

ROOT PRESSURE PROBLEM	ROOT PRESSURE SOLUTION	TRANSPIRATION PROBLEM	TRANSPIRATION SOLUTION
Moisture content too high	Decrease amount and/or frequency of irrigations	Temp too low	Decrease extraction or introduce more lights
EC too low	Increase strength of nutrient solution	RH too high	Increase extraction or introduce de-humidifier
Root temp too high	Use nutrient chiller / cover root zone with reflective material	Air flow too low	Introduce more room / pedestal fans

Diagram 2: Here are a few typical problems associated with a lower root pressure compared to transpiration, and how you can combat them.

Grower's TIP #36

By your friend SEZ

CLIMATE CONTROL! TOO OFTEN UNDERESTIMATED AND UNDER DONE.

Mostly because it often requires expensive and uneasy solutions, like making a large hole in a brick wall. However, climate control is the fundamental factor to get profusely healthy crops.

As we learned in past issues of CANNATalk, dry plant material is about 45% Carbon, 45% Oxygen and 6% Hydrogen. Briefly put, CO_2 and water... Which is assimilated by the plant as it transpires. Therefore focus should really be on making the plant sweat, without it burning out of course.

Climate, refers to the obvious temperature and humidity levels in the garden. But "climate" also includes watering frequencies, water content, water temperature, wind (and strength of), light intensity, quality and duration.

Let there be light! While the quality of the light has an impact on plant's function, most HID systems out there provide what is needed for plant functions. There is a downside to the brute power of HID lighting and it's the cause of many lower than expected crops, or cultural difficulties which can be linked to "radiant heat" which should never be assumed. Many growers do not realise that their lights are too close to the canopy, as radiant heat cannot be precisely assessed with thermometers nor can it be eliminated by wind power. That heat can lead to parts of the canopy being above optimal leaf temperature. In these areas, stomata will remain closed (some kind of water preserving reflex by the plant) and therefore the plants will not be assimilating (creating energy through photosynthesis) . Vast portions of the canopy can actually be shut down without having any visual symptoms outside of a slight droopiness of the upper plant section. Sometimes all it takes is to raise your lamps just a few inches to make a whole section of the canopy "open up".

Air temperature, is too many times half accounted for. Indoor grow rooms are usually designed to handle the cooling part. Grow lights run hot and most decent rooms are built with this in mind, but seldom really pay any attention to heating which may be needed when the lights are off. Shortcuts should not be taken in that regard, cold air may be leaking from exhaust ducts because of back-draft dampers being absent or broken; or simply from being setup in a cold basement. Heating an area is actually quite challenging too because heat sources are often too hot in their immediate surroundings and plants can easily get "cooked". Imagination may be required to get the heat evenly distributed in the grow room. If air gets to be cold, unwanted things may happen like humidity spiking up and the growing medium getting cold. This can lead to possible mildew outbreaks and low root pressure in the following days.

Root Temperature. Roots are kind of blunt in that regard, upward sap delivery is strongly influenced by root temperature, no matter what happens above the soil line. Yet, few growers really check the temperature of the root zone. Most will assume that the growing medium is the same as the ambient air temperature, which is a very bad idea. Many growing mediums have a tendency to get cold and stay cold. Ambient day time conditions have very little capacity to warm them up resulting in less sap being delivered to cool down the upper part (along with bringing essential nutrients). While this will rarely cause visible damages outside of droopiness, this will reduce yield and open the door to cultural problems.

Last but by no means least: humidity. Humidity is often willfully uncontrolled because it's the most expensive and hardest to manage, swinging in various directions as the day goes by. However, controlling humidity properly is no doubt one of the key ingredients to great yield. When humidity it is too high, plants cannot transpire, which blocks the absorption of CO_2 and the upward movement of nutrients. High humidity may cause undue stretching and can also provide the perfect conditions for mould and bacteria to grow. On the other side of the coin, being too dry creates stress that often leads plants to limit their growth, especially in terms of leaf surface. Less leaf surface means less potential of... You guessed it, CO_2 absorption! A dry climate also favours some mean bugs like mites.

Wind, also affects humidity in a way the meters cannot measure. When air movement on the leaf is too strong, it has a desiccating effect. As a side effect from this, plants "feel" the air being too dry and will react accordingly (mainly by reducing it's leaf area index as it develops) and reduce the potential for CO_2 assimilation. Not enough wind creates micro climates in the canopy where the air will be depleted of CO_2 and where temperature and humidity may be very different then what is recorded on your measuring equipment placed elsewhere in the grow room. This is another balance finding challenge, that may require lots of re-thinking for your grow room design.

Simply put, every factor needs to be monitored, controlled and never assumed!
Every factor you master will reward you tenfold.
Remember, at the end of the day, the name of the game is:
How much Carbon can you put in that plant?

Good Luck and Happy Gardening! •

Puzzle&WIN

CANNAtalk wouldn't be complete without a good old Sudoku puzzle. Sit down, relax and train your brain for a moment. It's not too difficult and you could win an awesome prize! Are you new to this kind of puzzle? Here's what to do: each row, column and 3x3 grid must contain all the numbers between one and nine, once only.

WIN A 1 LITRE BOTTLE OF CANNA RHIZOTONIC

6	4					7		5
			4	1			2	
	7	9			6	1		
3					4			
	8	7				4	5	
			1					8
		5	2			8	9	
	9			6	3			
4		8					1	6

PRIZES

You might be lucky this time! Another great prize is waiting for one of you. You just have to send us the correct solution (sending the middle part of the puzzle to editor@cannatalk.com and mention CANNAtalk 36), and if we pick your name,

A BOTTLE OF CANNA **RHIZOTONIC** COULD BE COMING YOUR WAY.

Winner **puzzle#34**

The winner of last Sudoku is **Mr. D. Hunt.** Congrats on your 1 litre bottle of CANNA PK 13/14! We will contact you as soon as possible to make sure you receive your prize. Enjoy!

WHAT'S NEXT

ORGANIC

Everyone loves organic products. Although, what does the term actually mean? Also, what do the various certifications imply that organic products carry? Simply just the notion of growing organically can warm the very cockles of your hearts, but be aware! Who's to say that just because it has a wholesome looking label and clever name, that it is actually organic.

CANNAtalk IS your magazine, YOUR VOTE COUNTS!

We enjoyed producing this magazine, and we hope you have enjoyed reading it! Maybe you want to thank us for this magazine, or you just have a question. Maybe you want to make a suggestion or comment on one of our articles. Whatever it is, we would like to hear from you. We love to read your comments and find out what issues our readers are facing. So don't hesitate to get in touch!

Write your answers to the puzzle, your comments, questions or suggestions on the answering card (we'll refund the postage). You can also visit our website or send us an e-mail at info@CANNAtalk.com.

Request information

- ☐ AQUA Fertilisers (Recirculating systems)
- ☐ HYDRO Fertilisers (Run to waste systems)
- ☐ COCO Fertilisers (Coco Coir)
- ☐ TERRA Fertilisers (potting mix)
- ☐ Additives (Optimizing your yields)
- ☐ List of shops in my area
- ☐ Send me a CANNA Calendar 2017. I've secretly enclosed 10 pounds in this envelope to pay for it.

Solution to the puzzle:

#36

CANNAtalk

SERIOUS GROWERS

CANNAtalk:

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