

# CANNAtalk

MAGAZINE FOR SERIOUS GROWERS

ISSUE 10 2010

## ROOTS

and root hairs



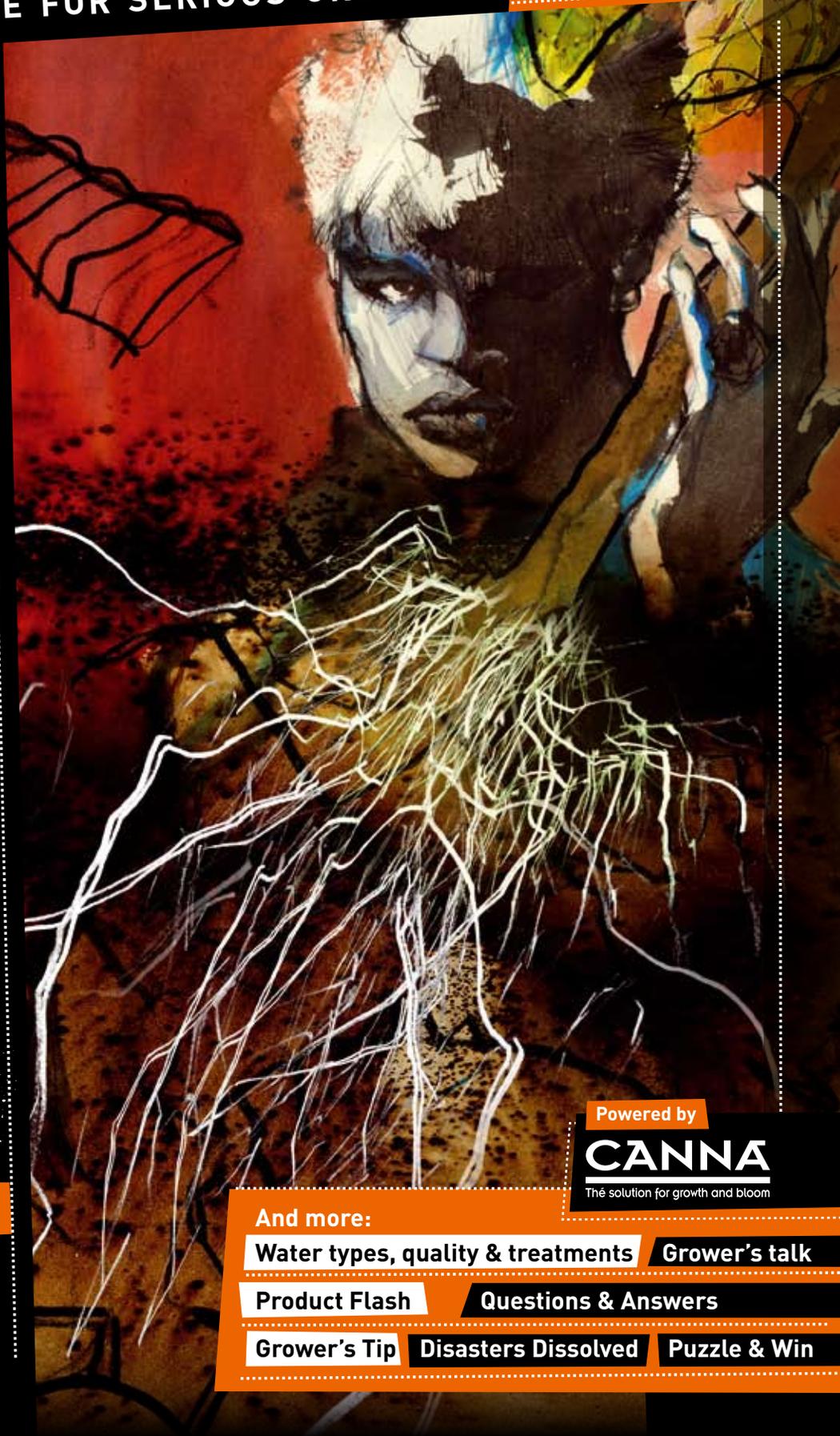
## SNOW KITING

Flying as a bird



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Mini-veggies



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# HOTalk:

You know how sometimes you see a tree's roots lifting the roads surface. That's actually just a part of the root that's causing that! The root cap (that protects the growing point of the root tip) can get so hard that it can break and grow through asphalt! How's that?!

**Roots!** They are the heart, lungs and brains of your plant. Regardless which system or medium you use to grow in, without roots a plant cannot survive. They tell a lot about your plant and its' health. A vigorous and healthy root zone makes for strong plants with lush flowering and bigger fruits. Isn't that what we all want? Read all about roots, root hairs and root tips in the article our own Research department wrote about the importance and function of roots on page 12 and on. You can read more on roots in the practical Growers Tip on page 20 where you'll find out that water, oxygen, nutrients and physical structure are the essential factors that roots need and explains how to get these factors in the right balance by examining them regularly.

Also an important element in hydroponics: water! The first article in this issue examines water types, quality and treatments including some tips and tricks for growers. We hope it'll help you out.

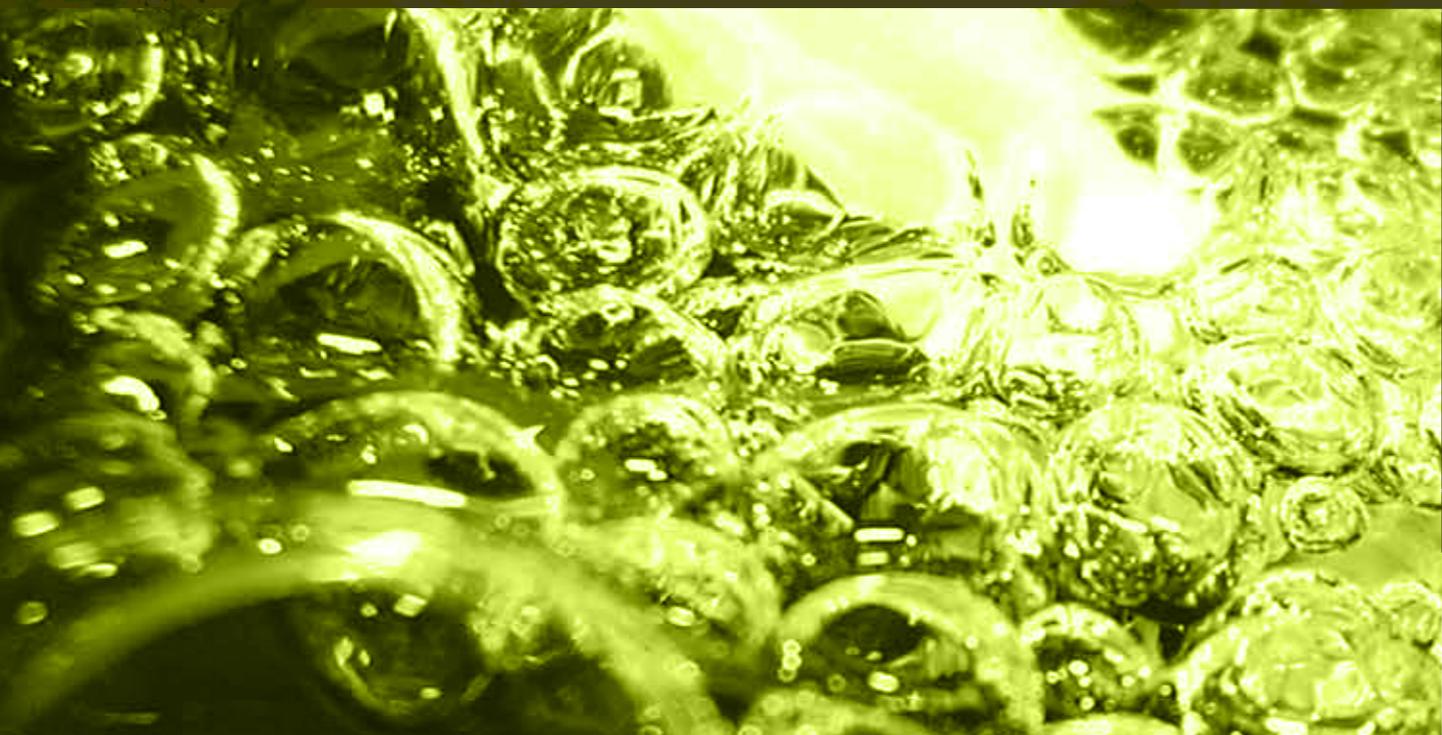
Cheers,  
Jeroen

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# WATER TYPES, QUALITY AND TREATMENTS



GOOD QUALITY WATER IS THE FOUNDATION OF ALL SOILLESS GROWING, HOWEVER NOT EVERYONE IS BLESSED WITH A SUITABLE WATER SOURCE FOR HYDROPONICS. EVEN CRYSTAL CLEAR WATER MAY CONTAIN A RANGE OF MINERALS, WATER TREATMENT CHEMICALS AND PATHOGENS WHICH CAN DAMAGE PLANTS AND SLOW GROWTH. LUCKILY, WATER IS RELATIVELY EASY TO TREAT AND SOME GROWERS CHOOSE TO INSTALL SMALL REVERSE OSMOSIS (RO) UNITS JUST TO ENSURE THEIR WATER IS ALWAYS TOP QUALITY.

By Lynette Morgan – Suntec



Figure 1: Aeration of chlorinated water supplies will cause the chlorine to dissipate, making the water safe to use in hydroponic systems.



Figure 2: Some water sources can carry plant disease pathogens such as Pythium which cause root browning and death if they take hold of a weakened plant.

## Water types and potential problems

Water can be sourced from wells, or collected from roofs, streams, rivers or dams, but many growers are reliant on municipal or city water supplies and while these are usually safe to drink, they can sometimes pose problems for plant growth. The main quality problems encountered with different water types are as follows.

### Ground water (streams, rivers and dams)

Ground water sourced from rivers, streams or stored in dams/reservoirs typically poses the most problems for soilless growers, particularly if the water is not treated before use. Water which is continually exposed to air and soil becomes contaminated with organic matter, minerals leach from the surrounding area, and pathogen spore loading can be high. Many greenhouse operations use open air storage dams as an economic method of storing large volumes of water collected from greenhouse roofs or other surfaces, however this water is typically filtered and treated before use. River or stream water often has inconsistent water

quality as operations being carried out up stream affect composition of the water and rainfall and flow rates also fluctuate throughout the year.

**Well water.** Water from wells in different locations around the world can vary considerably in quality. Very deep wells passing through certain soil layers will give an almost 'filtered water' although some minerals are always likely to be present in ground water. Some wells, particularly older types, or those which have been poorly maintained and are shallow can present problems with contamination from pathogens, nematodes and agrichemicals leached through the upper soil layers into the well water<sup>2</sup>. Well water may be 'hard' and contain levels of dissolved minerals such as calcium and magnesium and other elements depending on the soil type surrounding the well. High levels of sodium and trace elements are the most problematic for hydroponic growers, levels in excess of 2000ppm sodium have been found in inland well waters in some arid regions, although most well waters don't pose such an extreme problem. Sodium is not taken up by plants to any large extent, hence accumulates in recirculating systems, displacing other elements. Trace elements in ground water, such as copper, boron and zinc may sometimes occur at high levels. Soilless growers utilizing well water are advised to have a complete analysis carried out on their water source to determine if any potential problems exist.

**Rain water.** Rain water is generally low in minerals, however acid rain from industrial areas, sodium from coastal sites and high pathogen spore loads from agricultural areas do still occur<sup>3</sup>. Much of this contamination has been found to happen when rain water



**Figure 3:** Recirculating systems such as NFT can compound some water problems and unwanted elements such as sodium can accumulate over time.

falls on roof surfaces and picks up the organic matter, dust and pollutants which naturally collect there. In fact, numerous studies have shown that due to contamination following contact with catchments surfaces, stored rainwater often fails to meet the WHO guideline standards for drinking water especially with respect to microbial contamination<sup>3</sup>. In the USA, rainwater collected within 48km of urban centres is not recommended for drinking due to atmospheric pollution<sup>3</sup>. While drinking water standards don't necessarily apply to hydroponic growing, the fact that high levels of microbial contamination often occur in stored rainwater means that common plant pathogen spores are also likely to be present. Rain water is best collected from clean surfaces with a 'first flush'

device installed, which allows the first few minutes of rainfall to be discharged from the roof before any is collected for use. Rain water may also contain traces of zinc and lead<sup>5</sup> from galvanized roof surfaces or where lead flashings and paint may have been used<sup>4</sup> and is a greater problem when the pH of the rain water is low. Generally, rain water collected from greenhouse roofs is free of zinc and lead problems.

**Hard or soft water.** 'Hard' and 'soft' are terms used to describe the quality of many water sources. Hard water has a high mineral content, usually originating from magnesium, calcium carbonate, bicarbonate or calcium sulphate, which can cause hard, white lime scale to form on surfaces and growing equipment. Hard water may also have a high alkalinity and a high pH, meaning that considerably more acid is required to lower the pH in the hydroponic system to ideal levels. While hard water sources do contain useful minerals (Ca and Mg), these can upset the balance of the nutrient solution and make other ions less available for plant uptake. Smaller growers can counteract this by making use of one of the many 'hard water' nutrient products on the market. Soft water, by comparison, is a low mineral water source. Often rainwater is 'soft', while municipal water sources across the country range from very hard to soft, depending on where the individual city water supply is taken from.

**Other water types.** Some growers prefer to start with water which has been pre-treated to remove any chemicals, pathogens and other contaminants. RO (reverse osmosis), distilled water, filtered and bottled water are all options for small growing systems and those concerned with water quality.

### City and Municipal water quality.

Many city water sources are perfectly acceptable for soilless growers and hydroponic systems and can be used with no adjustment or treatment. However, the water treatment options used by city water suppliers change over time and with advancing technology. In the past, the main concern was chlorine in city water supplies. Chlorine is a disinfection agent which destroys bacteria and human pathogens, and residual chlorine can be detected by smell in a water source. High levels of chlorine can be toxic to sensitive plants, however chlorine dissipates rapidly into the air and can easily be removed by aerating the water or just letting the water sit or age for a few days before use. While the chlorination of water supplies was easy to deal with, nowadays, city water treatment plants are moving more towards the use of other methods of treating drinking water. It has been found that some human pathogens were resistant to the action of chlorine, and consequently drinking water regulations were changed and alternative disinfection methods are being used more frequently. These days, water may still be chlorinated, but an increasing number of city water supplies have switched to use of ozone, UV light, chloramines, and chlorine dioxide. While many



**Figure 4:** Solution culture systems don't have the buffering capacity of those using a soilless substrate so are more prone to problems with water quality.



of these methods present no problem for hydroponics and soilless growers, the use of chloramines and other chemicals by many city water treatment plants can pose a problem for plants where high levels are regularly dosed into water supplies.

Chloramines are much more persistent than chlorine and take a lot longer to dissipate from treated water, hence they can build up in hydroponic systems and cause plant damage. Damage to plants caused by chloramines in city water supplies is also very difficult to diagnose as it looks similar to the damage caused by many root rot pathogens and growers are often unaware of what is causing the problem. Some plants are also naturally much more sensitive to chloramines than others, so determining levels of toxicity has also been difficult. One hydroponic research study has estimated that the critical level of chloramines at which lettuce plant growth was significantly inhibited was 0.18 mg Cl/g root fresh weight<sup>1</sup>. Hydroponic growers who have concerns about the use of chloramines in their city water supply can treat the water with specifically designed activated carbon filters or by using a dechlorinating chemical or water conditioners which are sold by the aquarium trade to treat the water for fish tanks. The chloramine carbon filters must be of the correct type that has a high quality granular activated carbon that allows for the long contact time required for chloramine removal. Growing systems that utilize substrates such as coco are a safer option than soilless culture or recirculating systems where water treatment chemicals are suspected to be a problem. Natural substrates provide a 'buffering' capacity in a similar way to soil and can deactivate some of the treatment chemicals contained in the water supply.

Other common water quality problems include the use of 'water softener' chemical either by city treatment plants, or in the home – these are often sodium salts which result in problematic sodium levels in the hydroponic nutrient. If sodium levels are too high, either through use of water softener chemicals or naturally occurring in the water supply, RO is the best option for sodium sensitive crops.

## TIPS AND TRICKS FOR GROWERS

### How do you know if you have a water quality problem?

It can be very difficult to determine if a water quality issue is responsible for any plant growth problems which might be occurring. Many diseases and errors with nutrient management or incorrect environmental conditions will produce symptoms very similar to common water quality problems. Ideally, obtaining a full water analysis is useful for most growers, however

detecting other issues such as chemical or microbial contamination is more complex. The simplest method of determining if water quality is the cause of growth problems is to run a seedling trial – growing sensitive seedlings such as lettuce using RO or distilled water as the 'control' or comparison will usually show up any problems originating from the water supply. Keeping all other factors such as nutrients, temperature and light the same between the plants in the different water samples and using a solution culture system will give the most accurate test. Comparing growth in the pure water to the suspected water sample will reveal any problems (if growth problems appear in both seedling treatment water samples, then something other than water quality is to blame). Water quality problems may show as stunted roots which don't expand downwards, short, brown roots, yellowing of the new leaves, stunted foliage growth, sunken brown spots on the foliage, leaf burn and even plant death.

### What to do about suspected microbial contamination

Zoospore pathogenic fungi such as Pythium and bacteria can survive in and be distributed by water<sup>6</sup>. Water sources which may not have been treated and may contain disease pathogens such as ground, river or steam water can be relatively easily cleaned up by the grower before use. The safest options are UV, ozone and slow sand filtration as these won't leave chemical residues which may harm young, sensitive root systems. Small UV treatment and filtration systems such as those used in fish ponds and aquariums are suitable for treating water for hydroponic use and will kill plant pathogens and algae. However these are best used for treating water only, not nutrient solutions as UV can make some nutrients unavailable for plant uptake.

### What to do about other contaminants and treatment chemicals

Activated charcoal (slow) filters are still one of the more reliable and inexpensive ways of removing suspected contaminants from a water supply. Herbicides, pesticides, chlorine, chloramines, and other chemicals are reduced to low levels by suitable activated charcoal filters and these can be used by small and large growers alike. If chlorine alone is a problem, aerating the water for 48 hours by using a small air pump will dissipate this chemical. Using substrate-based systems incorporating a media such as coco fibre will give a greater degree of protection and 'buffering' capacity where chemical contaminants are suspected.

### What to do about excess minerals

Often it is possible to dilute a water supply which may have a slight excess in certain minerals, particularly trace elements, with a higher quality water source, however for water sources with a high natural salinity

reverse osmosis or distillation are the only methods of demineralization. Some crops such as tomatoes are far more tolerant of excess minerals and salinity than others such as lettuce, so this factor should be taken into account.

### What to do about 'hard' water with a high pH

Hard water is best treated with acid to lower the pH to 6.5 before adding any nutrients to make up the nutrient solution or before using the water to top up a nutrient reservoir. This will reduce the total amount of acid required in the system to keep pH under control. Hard water also contains minerals such as calcium and magnesium, so using a specific 'hard water' nutrient formulation or product in recirculating systems (like CANNA Substra Hard Water) is advised, since these will keep nutrient ratios more in balance and also assist with keeping pH in check. •

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**Figure 5:** Even clean, clear water may contain a range of minerals, water treatment chemical and pathogens which can damage plant growth.



I'm certain there's not a better method of growing indoors.

# Growers TALK

For a while now the CANNA website offers the possibility to submit your growing experience. The most useful and informative growing experiences qualify for publication on the website and in CANNAtalk magazine. The ones that are selected are awarded with \$ 250 worth of nutrients.

Below you'll find one that was submitted through [www.canna-hydroponics.com](http://www.canna-hydroponics.com) from a guy growing on CANNA COCO. Congratulations man, we'll contact you to make sure you'll receive your price.

**Which CANNA products do you use?**

CANNA COCO, CANNA Coco A + B, RHIZOTONIC, CANNAZYM, CANNABOOST, PK13/14

**Why do you use CANNA products?**

CANNA offers ease of use, supreme quality, and R&D to deliver the very best plant nutrients/mediums on the market, period.

**Are there any specific or unusual handlings you did during the growing process?**

Followed directions precisely

**Did you suffer from any problems while growing and how did you solve this?**

None

**What kind of mark would you give CANNA, and please explain why?**

5 stars, 2 thumbs up, High five, 1st place, I could go on and on.

**Tell a little bit about your growing situation:**

About a year ago, upset with multiple hail storms and insect infestations I decided to move my gardening skills indoors under artificial light. A rarely used walk in closet was chosen for the indoor garden. It measured approximately 6'x6'. I knew right away that my desire to have a 12 hour photo-period and an 18 hour photo-period was going to be

a challenge. A tent shelf was built in the corner and the remaining main grow area measured about 14.5 sq ft. A 1000 watt bulb and air cooled fixture was placed above the main area. The resulting light density was nearly overkill but not off the charts. My first crops were grown in 3 gallon containers in so called "high quality" soil from the nursery. The plants suffered compacted soil conditions and various nutrient deficiencies. After 2 disappointing harvests I added up the cost of the soil and specialty nutrients I was using, and concluded that there must be a better way.

A quick trip to the nursery resulted in an enlightening conversation with the owner about the problems associated with growing in containers. He pursued me to try the CANNA COCO system of growing because it solves all these issues. I purchased the complete system, COCO medium, Coco A+B nutrient and the additives RHIZOTONIC, CANNAZYM, PK 13/14 and the mysterious CANNABOOST. Nutrient solution is applied every watering in the minimum recommended amounts at a rate of 1 gal per 3 gallons of medium, this allows ample run-off to flush the medium every watering, about every 3-4 days. PH and E.C. were checked initially to ensure they were within limits, but every time no matter what week of the schedule, these values were within the recommendations by CANNA. Fast forward to harvest time, the results were outstanding to say the least. Yield was increased by nearly 50% over using the old soil method. Taste, aroma and looks were almost unreal. The cost associated with this system are offset by the increase in yields, and ease of use. After 3 harvests of using the CANNA COCO system I'm certain there is not a better method of growing indoors in containers and would like to thank you for providing such a quality system. How rare is it to say such things these days as companies will say anything to make a buck. CANNA for life!

Taste, aroma and looks were almost unreal.

The results were outstanding to say the least.



# Product

# FLASH

## Hydro-Logic UPGRADES THE STEALTH-RO!!!

The Stealth-R0100 and Stealth-R0200 have been the industry leading reverse osmosis filters for several years. The quality and performance of these filters has made them the #1 choice for hydroponics and organic soil growers.

Hydro-Logic is proud to announce some important upgrades to both systems. First and foremost, is the addition of an optional flow restrictor that will bring the already efficient 3:1 ratio down to a 2:1 ratio of drain to product water. Both units come plumbed with the standard restrictor (3:1 ratio) that already beats the competition in saving drain water. With the new optional restrictor, an additional 33% of drain water can be saved making these the greenest and most efficient units on the market, hands down. We have also included a pre-plumbed pressure gauge. This will allow users to monitor system performance and diagnose low pressure & low flow problems. Another standard upgrade is the green certified coconut carbon block filter. This is the world's first eco-friendly carbon filter and a Hydro-Logic exclusive product. The retail box and instructions have been completely redesigned. Hydro-Logic brings you all these great upgrades at no increase in price. Pure water's not magic, it's logic.



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# ROOTS AND ROOT HAIRS

ROOTS ARE ONE OF THE MOST IMPORTANT PARTS OF THE PLANT FOR

TAKING UP NUTRIENTS AND WATER. FOR SOME GROWERS, THEY ARE SO

IMPORTANT THAT THEY ALWAYS CHECK THE ROOT SYSTEM BEFORE WATERING.

by Pieter Klaassen, CANNA Research



Figure 1: Don't drown your plant's roots!

## The foundation

Plants need roots in order to stay upright and not to be blown over by the wind. Water and nutrients also enter the plant through the root system.

The root system will continue to increase in volume for as long as the plant as a whole, including the foliage, continues to grow. When a certain equilibrium has been reached, the plant will simply maintain its volume, and cease to grow. Even in this state of equilibrium, the roots continue to grow, but will die back partly as well. To understand this better, we will have to divide the root system into parts.

## The root system

As mentioned, the root system will only increase in volume for as long as the rest of the plant continues to grow. However, transpiration from the leaves can also cause more roots to form in order to pump up the water needed. In the end, an equilibrium is established between the roots and the plant. A general rule of thumb is that the root system should comprise 30% of the total plant volume. Although this rule applies fairly consistently to plants in the open air, in substrate culture this does not always have to be the case. You can grow large plants in small pots as long as you supply them with water and nutrients and do not allow the pot to get too dry or too wet.

To reduce the chance of this happening, we advise a large medium volume.

In hydro cultures you will also see that fewer roots are needed in order to grow a larger plant. This is because each root hair is able to absorb more water and nutrients. This is one of the reasons that hydro culture has the potential to produce higher yields

## Root hairs

The root hairs are where most of the nutrients and water are absorbed. The root tip produces new cells on a daily basis, and thus also root hairs. When the plant is short of water and/or nutrients, it will devote more assimilates (photosynthesis energy) to producing more cells in the





root tip. This also generates more root hairs until the root has found what the plant needs (more water or nutrients). The oldest root hairs will then die off. In practice, as the medium gets drier, the root starts looking for water and will produce more cells, and thus more root hairs. Absorption capacity increases, because more root hairs are produced. But the youngest root hairs will enter even more "moist" soil. The plant can still take up water and sometimes even more! This is why the general advice is to grow on the dry side: when you water, some of the root hairs become redundant. To limit the energy-loss (dissimilation energy), the oldest root hairs will die off.

If you give the plant too much water, all the root hairs will die off. Effectively, the roots drown and it takes at least three days before a root tip has produced enough new cells with root hairs. The dying off of root hairs also happens after repotting the plants or after moving them very roughly. So when this is the case, go gently on your climate control the first 3 days. And pay good attention to the watering: don't overdo it but on the other hand, don't let the plant dry out too much.

## The root

Unlike the root hairs, the roots themselves are visible to humans. The root cells, without root hairs this time, will stretch to enable the propulsion of the youngest part of the root forwards. The outermost cells of the root suberise (form a hard surface, like the bark of a tree), after which they only serve as a pipeline to transport the water and nutrients absorbed towards the stem and the rest of the plant.

Plants in the vegetative phase will increase in weight, both above and below the ground. Even in the first stage of the generative phase, the leaf surface area will increase and an active climate will cause the roots to increase in volume. Eventually, an equilibrium will be reached. This maximum equilibrium usually comes when around 50% to 70% of the flowering period has elapsed (for example, week 6 of a 10-week growing cycle). In potting mix cultures, the plant can absorb 5 to 6 litres of water/m<sup>2</sup> per day. But in hydro cultures more water can be absorbed with fewer root tips (but not fewer root-hairs!). •



## Root tips

At the end of every root is the root tip. The root tip consists of a root cap and a growing point. The root cap is very hard and protects the growing point. It is so hard, in fact, that it can break and grow through asphalt if the cap has enough energy. In the growing point behind the cap, new cells are created. The most important plant hormones are also produced here. These will not be discussed in this article. For more information on plant hormones, please see CANNAtalk 9. It is these new cells that cause the roots to grow further through the medium. The roots are able to do this not only because new cells are created, but also because the existing cells are stretched. The first cells also contain bulges, called root hairs.

Figure 2: Root tip and cross section of root tip



# Fact GRAPHIC

## Lightning DID YOU KNOW...

- That lightning travels with an average speed of 60,000 km per second?
- The sound of thunder can rock a rainbow?
- That the heat of a lightning beam is much higher than that of the sun?
- That lightning can change an ordinary piece of iron into a magnet?
- That lightning beams can get 6 km long, but only 2,5 cm wide?
- That one man in USA has been struck 7 times?

# Questions

# Answers

These pages are being created by our readers and visitors of our website. In this section we publish questions sent to our research department via our website [www.canna-hydroponics.com](http://www.canna-hydroponics.com). They asked our help in solving their growing issues. We trust that by reading these pages your issues will be solved as well!

## Question

I have some previously opened CANNA products that have been sitting in a cool dark place for about 6 months. They are all about half full. Some are still within the expiry date and some are past it. Is the expiry date meant for open products or unused products? How far past the expiry date is a previously opened container, stored in a cool, dark, dry place still OK to use if at all? Thank you for your help. -DVC

## Answer

Hello, let me start by informing you that the dates printed on our products are not expiry dates, but Best Before dates. CANNA guarantees the effect of the product until the mentioned date on the bottle when the product has been stored under the right conditions. Once the products are opened, and stored in a refrigerated place, the shelf life is hardly affected. But once oxygen can reach opened products, all bets are off. Nutrients, on the other hand, are generally good until you notice a change like precipitation, discoloration, clouding, or any other changes.

## Answer

Hello, glad you are enjoying the Coco. It is easy. Watering schedules are tough at best as everything from plant size to humidity levels influence the rate of water usage. Best to water when the plant needs it, when 50% by weight of the water it holds at full capacity is gone from the medium. Use a scale initially until you are familiar, then you can base it on feel and look. Plant the plant in the Coco right out of the bag and weight. Then water with nutrient mix until water flows freely from the bottom of the container. Allow the drainage to stop and weigh again. The difference in the two weights is all moisture. When 50% of this weight difference is gone then water again, always with nutrients and always till water moves through the container to drainage, 20% more than what the container holds is great. A 3 gallon pot with Coco should hold approximately 1.2 gallons of water in total. Coco does not compact so no issues there.



## Question

Are there other hormones present in RHIZOTONIC other than Oligosaccharides? Are cytokinins present? What is the benefit of having them, and are there negatives?

## Answer

Hello, there are many things in RHIZOTONIC that directly benefit the plants root system among other systems. In addition to most of the minor and micro nutrients, it also has many vitamins, amino acids, and natural PGR's (plant growth regulators). This includes Cytokinin, Gibberellins, Auxins and Abscisic acid (see CT9 for their functions). There are also oligosaccharides present, enough to possibly affect disease resistance if current research holds true, however these are not hormones. On the other hand, our Boost line is composed of more significant amounts of the oligosaccharides. RHIZOTONIC is an outstanding tonic for a healthy root system, used early in a larger amount, it aids in initial root development, while much smaller regular doses after the initial stage aid in maintaining overall root and plant health. The only negatives come if you over apply pushing too much energy into the root system by continuing the larger doses. Or, in the case of rooted cuttings, leaving them in the rooting system too long after application and the subsequent root damage that occur from tearing them out.

## Question

I mix my nutrients for my Coco (A+B, BOOST, etc.) with water in a jug and my question is: How long can I store the mixture before I need to throw it out and remix a new? Thanks in advance, Jim

## Answer

Hello, well, if you keep them dark and cool, a couple weeks will do it. Have an eye out for any changes along the way such as cloudiness or precipitation.

## Question

Hello all, I know that CANNA SUBSTRA is for the run-to-waste system, and CANNA AQUA is for the re-circulating systems. But what is the difference between these two products? What would happen, say, if one used SUBSTRA in a re-circulating system, and AQUA in a run to waste system? Yours sincerely, Jon

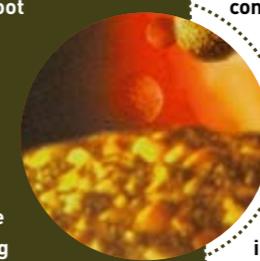


## Answer

Hi Jon, thank you very much for your question! In a re-circulating (CANNA AQUA) system the plants take elements out of the water every time it passes through the medium. This will influence the pH and some of the nutrients. To keep this in balance we have to make it more stable and longer term available. CANNA SUBSTRA nutrients will only pass the roots once, so the nutrients are immediately available and are refreshed by new solution at each watering and balanced by allowing some drainage (20%). The pH of the solution is not an issue as it is set in the tank and should maintain because no drainage from the medium is influencing it. SUBSTRA in re-circulating system will give pH problems; AQUA will show deficiencies in Run-to-Waste systems. If the pH is incorrect, some nutrients have problems in their solubility, so plants will not get those elements in the right amounts. Results will be negatively influenced.

## Question

Hello CANNA, I have a question in regards to CANNAZYM. As far as I know, CANNAZYM contains living bacteria who colonize the root system. When I used it, my roots became slightly beige instead of the usual white/transparent, but they also started growing in size and growing more side roots. My question is: in a deep water culture hydro system, I noticed the beige tint on my roots disappearing and them returning to perfect white after about a week since the reservoir was freshly mixed (CANNAZYM, RHIZOTONIC, A+B Vega). Is this because the bacteria colony ran out of food? Should I reapply CANNAZYM in my next mix? Or two mixes later? If CANNAZYM is an active bacteria colony, would blackstrap molasses work as a way of providing them with sugars/food, in a non organic deep water culture? (Compared to organic soil/soilless mixes who feed the bacteria and fungi colonies with molasses)



## Answer

Hello, there are no living organisms in CANNAZYM. CANNAZYM is the enzyme complex that breaks down cellulose, and hemicellulose into simple sugar compounds; it is derived from micro-life. It also has a natural antiseptic to protect the root system and a plant extract that has various vitamins. The beige coloring could be caused by many things from oxidation of the root surface to inhibition of cellulose containing fungi that were becoming active on the root surface. CANNAZYM is a neutral pH product, with an active ingredient approved by the World Health Organization as a food additive. It is totally benign. We do not recommend micro colonies in water culture because there is nothing for them to do. Because of the physics of growing true hydro, when you load up on the micro life, they use up the nutrients or at least the ones they want. Organics simply do not work in hydro to any level of reliability or results. Consequently most systems run mineral nutrient sources that do not need breaking down, the purpose of the micro-life. The micro life feeds much faster than a plant can, resulting in their 'out competing' the plants and crop mineral deficiencies. Incidental micro-life is fine and less affecting. Even some of the "beneficials" will invade live material when needed. 5 - 7 day tank changes are always recommended. Aqua or fish culture is a different type system but set up different with different colonies that are introduced slowly and naturally to achieve balance. There are two chambers for activity, the fish side and the crop side, both with different needs and activity. Just my thought.

## Question

Hello I'm using BIOCANNA right now and I was wondering if I can use BIOCANNA in re-circulating systems or in drip systems. Or is BIOCANNA just drain to waste. When flowering how and when do you recommend using PK13/14 and BIOBOOST. Also what if I want to use a organic PK13/14 will the BIOBOOST still work. Thank you so much I hope it is not too many questions hope to hear from you soon

## Answer

Hello, no, sorry, BIOCANNA, like every other true organic product, will only work under the influence of a root zone and medium, including other biotics. This is for many reasons some complex some simple. Much research is ongoing in quest of other methods; however everything has been negative to date. You can try other PK products but would have to ensure that it is applied at the correct amount for a CANNA base product. There is nothing organic about any PK supplement. The problem is that organic P or K will be less available to the plant in a controlled fashion, and would have to be applied separate far enough ahead of the need, to be effective. Sorry, if you are intent on maintaining a total organic product, then you have to be willing to work with nature. This means smaller harvest and better planning, but higher quality.



# What's HAPPENING

You've probably already heard of kite surfing. But kite surfing during the winter is not much much fun, unless you can take a trip to the Caribbean. So that's why they invented snow kiting. You can snow kite on skis or on a snowboard, whichever you find more comfortable. Plus, you need a Kite of course. But what is snow kiting exactly? And how does it work?

# Snowkiting

## In the beginning

**I**t all started in the 1960s with a German guy called Dieter Strasilla. He started out gliding, which soon turned into parapenting, which then became parachute-skiing in the early 1970s. Dieter was inspired by Otto Lilienthal, another German who was the founding father of gliding. Lilienthal was also an inspiration for the Wright Brothers when they were designing the first aeroplane.

In the 1980s, snow kites thought that by crossing lake Erie in USA they had taken the sport as far as it could go. But in the 1990s freestyle snow kiting pushed back the boundaries even further. A competition circuit was set up. Since the turn of the century, snow kiting has been taking giant strides forward thanks to improved snow kite technology. Now, kites are no longer limited to going downhill, they can go uphill, too, and they can even take off and leave the ground completely. Yes, snow kites can fly! But not every snow kiter is a freestyler. There are still many for whom crossing a mountain plateau or deep frozen lake is still the ultimate thrill. And there are a lot of snow kiting hotspots in Europe: Norway, France and Switzerland, to name just a few. But you can snow kite anywhere with large open fields, frozen lakes, rolling hills, plateaus or glaciers – so that include many parts of the world!



## Kites

There are many different types of kites. There are foil kites or inflatable kites, and there are different sizes and shapes. There are kites for beginners and kites for advanced kites, so there's nothing to stop you giving it a try!

The most common kites are made of foil. These are double-layered, and the side facing the wind – which is known as the 'leading edge' – is open. This way, air can fill the kite to give it its wing or foil shape. Some people also use inflatable kites. These were originally for use on water, but they do the job on the snow just as well. The size of the kite depends on both the weight of the snow kiter and the strength of the wind. It also depends if you are using skis or a snowboard. Skis are recommended for beginners as they give you more stability.

Snow kiting is not hard to learn and better still, it is even easier than kite boarding because snow is easier to stand and balance on! You also need less wind to get going, so you can use a smaller kite than for kite surfing. Jumps and turns are easier and, depending on how you land, softer. Once your kite is in the air and you start your descent, it is far easier to keep yourself on the snowboard. Many advanced kites prefer to use a snowboard because it gives them more flexibility and ease. Probably the ultimate destination for freestyle snow kites is Norway. The Hardangervidda glacier plateau is like heaven on earth

with so much room to manoeuvre and practice all the jumps you can imagine!

## Guillaume Chastagnol

Probably the most famous snow kiter is a French guy called Guillaume Chastagnol, who goes by the nickname of Chasta. He has not only been French national champion many times, but he was also the very first world champion snow kiter (he won this title no less than three times). He even participated in the 1998 Winter Olympics in Nagano, Japan, where he finished fifth in the snowboard halfpipe competition. As a real snow lover, he lives in the northern hemisphere for six months a year and in the southern hemisphere for the other six, so that he doesn't miss a single day of snow!! He even has his own snow kiting event called The Chastadays.

Since environmental issues are becoming more and more important lately (and why shouldn't they?), snow kiting can be promoted as an environmentally friendly sport. The only thing you need, except for your equipment and snow, is wind! You can find that everywhere and it's completely sustainable! You don't have to take the chair lift up to the top (or wait in line for a ticket) because the kite will take you up there too! On your descent, you can reach speeds as high as 100 km per hour, and there's no cop to give you a speeding ticket! You can even take off and fly! Flying as free as a bird – isn't that everyone's ultimate dream? Well, start snow kiting and it can become reality!





# Disasters

# dissolved

**About phosphorus in short:** Phosphorus plays an important role for all living organisms and is an essential nutrient element for plants and animals. It has a key position in the combustion processes of the cell, and in the total energy transfer of the plant. It is also a “building block” of the cell walls, the DNA, and all sorts of proteins and enzymes.

For young plants, the presence of phosphate is indispensable; about 3/4 of the phosphorus consumed during a plant’s life cycle is absorbed in the first quarter of its life. The largest concentrations of phosphorus are found in the developing parts of the plant: the roots, the growth shoots and the vascular tissue.

# PHOSPHORUS DEFICIENCY

Phosphate combinations in a form that can be utilized by plants are rarely found in natural form. In the past men used pulverized bones as fertilizer and later treated these with sulphuric acid, making them easier to absorb. In the second half of the 19th Century, guano, a natural phosphate, is known to have been applied on a large scale in agriculture. These days, basic materials are extracted from natural phosphates. These are phosphate-rich ores mined in countries such as Morocco, Algeria, and North and South America. To make these suitable for agriculture and gardening, they are first acidified and purified. In alternative agriculture, the natural phosphates are finely ground, or heated, and are sold as enlarged granules.

## Deficiency

Certain phosphorus deficiency symptoms described in specialized literature should not be confused with

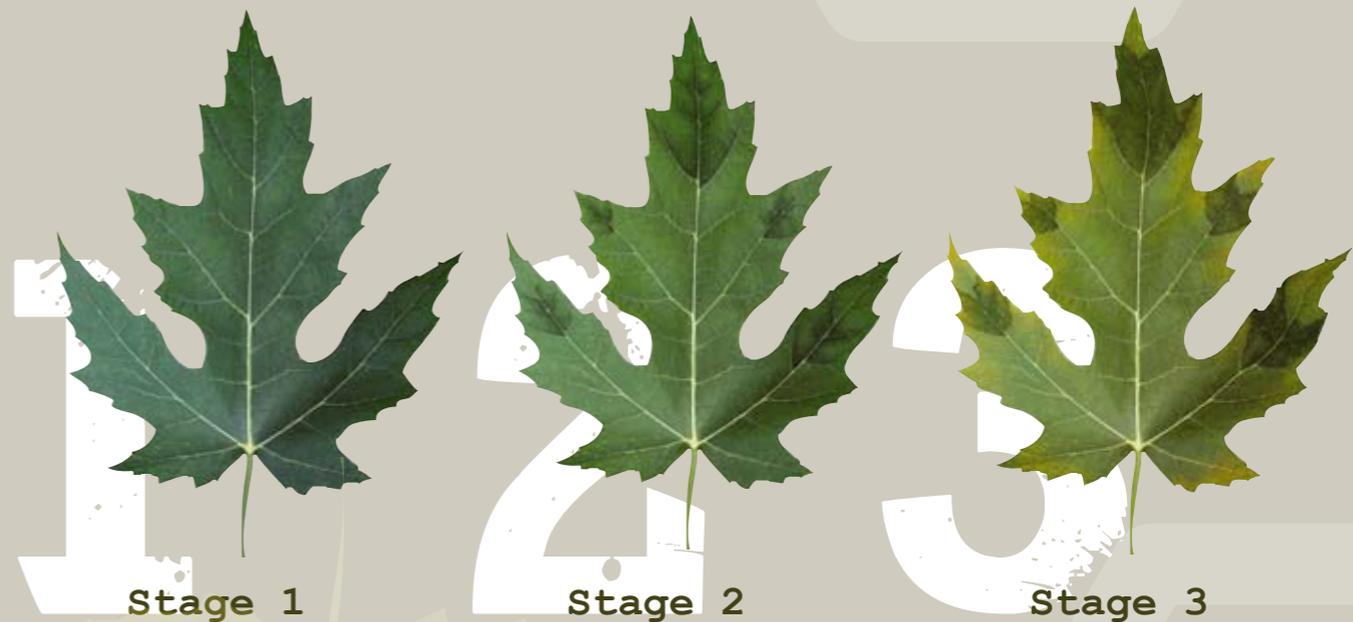
a nitrogen shortage. Namely, a phosphorus deficiency does not manifest itself as an obvious purple coloring of stems and leaf stems, but rather as a small plant with purple/black necrotic leaf parts, which later on become malformed and shriveled.

## Reasons for a deficiency

Due to the low concentrations in which phosphate appears in nature, the affinity of plant cells for phosphorous allows easy absorption through the whole root. Therefore, shortages do not happen very often, except when: The growing medium has too high a pH (higher than pH 7). In such cases the plant cannot absorb phosphorus due to the fact that insoluble phosphorous compounds develop. The ground is too acidic, or too rich in iron and zinc. The soil has become fixated.

## Development of a DEFICIENCY

- I. At first, the plant becomes dark green - a different sort of dark green (blue/green) as appears when there is a shortage of potassium
- II. The growth in height and the development of the plant’s side shoots are inhibited.
- III. After 2 to 3 weeks, dark purple/black necrotic spots appear on the old and medium-old leaves, making the leaves malformed.
- IV. The purple/black necroses expand to the leaf’s stem. The leaf turns, curls considerably and dies off.
- V. The dead leaves are curled and shriveled, have a typical ochre-purple color, and fall off.
- VI. The plant flowers fully, but the yield will be minimal.



## Solutions to resolve a deficiency

Inorganic phosphates, in ion form, are very easy to absorb. As far as is known, plants do not take up phosphates in organic form. Still, through the decomposition of organic compounds, inorganic phosphates can be released. Due to their residual working, generally, the older the ground is, the richer it is in phosphates. When a deficiency is established, simply using phosphate containing fertilizer will not have much effect; the phosphate barely penetrates the soil, and the growth problems of the young plant will not be rectified. That’s why you should mix the phosphate fertilizer thoroughly through the soil. Prevention is better than a cure. Use good soil and good fertilizer, and get professional advice from specialized shops.

Go to your shop for expert advice. They have the right products available. A correctly formulated fertilizer contains sufficient phosphorus; When the pH is too high, the medium should be made more acidic with the help of a thinned solution of phosphoric acid. Safe pH values are: 5.2 - 6.2 for hydro culture, 6 - 7 for clay soils, 5.5 - 6.5 for potting soils and sandy soils. Alternative phosphate-containing fertilizers are, among others: guano, blood meal, bone meal, natural phosphates, basic slag and slurry manure. The disadvantage is that they contain phosphates in very different concentrations, and they are not very easy to absorb. Therefore, they should usually be ground as finely as possible, and acidified so they will be more soluble. It’s best to choose products that have a guaranteed phosphate percentage on the packaging. •



# Grower's TIP #26

## Are Your Roots Trying to Tell You Something?

What can a root system tell a grower about his or her cultivation methods? An awful lot, is the answer. Roots and the root system are programmed to develop in order to maximize the four essential factors that they are searching for:

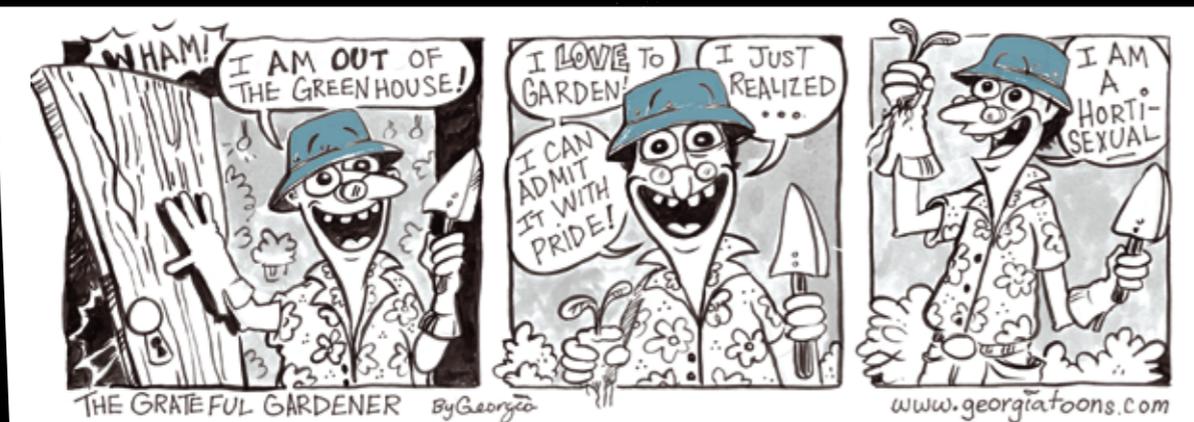
1. WATER, 2. OXYGEN, 3. NUTRIENTS, AND 4. PHYSICAL STRUCTURE.

By examining a root system and the parts of the plant above the ground, a grower can get a feeling for what is going on, just by keeping in mind what the roots are looking for.

In a container, for instance, roots that grow abundantly directly beneath the surface, but do not penetrate the potting mix deeply can indicate overwatering. Conversely, roots that only begin an inch or two from the surface may indicate underwatering. Roots that cover the entire potting mix profile are happy from top to bottom. Why? Because roots need both oxygen and water: overwatering results in water-clogged potting mix and there is less air available deeper down, so the roots do not grow deep. But roots need moisture, too, and if the plants are underwatered, the potting mix nearer the surface will dry out between waterings. The roots will only develop where the moisture level is consistently right – i.e. deeper down. Good root growth from top to bottom shows a good ratio between air and water throughout the potting mix profile. If the root system looks good and not old or pot-bound, but the upper part of the plant has issues, then the nutrient level is off. Thin root systems that look generally fine could be under temperature stress. Slow roots that do not match top growth could be an indication that the irrigation water is too cold. Roots that have a higher volume of roots in the middle of the container but less outside could indicate a lack of friability (i.e. the potting mix is too compacted).

So what are your roots telling you? It could be the quietest scream you never heard!

## The Grateful Gardener



# Mini CHILLI

# PEPPER!

This is the third article in the Mini-veggies series, and once again, we're going to look at a fruiting vegetable – chilli peppers this time. Chilli peppers just seem to grow and grow in popularity all around the world. There are 'Chiliheads' all around the globe, as well as a lot of chilli festivals.



### Origin

The chilli pepper originated in Central and South America. The Incas and the Aztecs were cultivating these crops as early as 7,000 B.C., but Europeans only came into contact with the chilli pepper after Columbus discovered America. Since then, over 3,000 registered species have been developed. Of these, five are widely cultivated: *Capsicum annum*, *Capsicum chinense*, *Capsicum baccatum*, *Capsicum frutescens* and *Capsicum pubescens*. All have their own special characteristics. India is currently the world's largest chilli producer.



## Growing

Chillies come in a whole range of sizes, from just 1 inch to half a foot! They also come in many different colours: yellow, orange, red, green, purple and brown!

Not all varieties of chillies are easy to grow. If you're looking for quick results, growing chillies is probably not for you!

Obviously, to grow plants, you need seeds. You can separate the good seeds from the bad by plunging them into water. All the seeds that float can be discarded as they will probably not germinate. Peppers need a high temperature (above 77°F), mild nights and a lot of light. They also like to be rooted in an airy soil and need to be fed on a regular basis. If you don't want the different varieties to pollinate each other, you can cover the flower bud with an empty tea bag before it opens. Tapping it daily will help the flower to fall off. Once the flower turns into a fruit, you can remove the tea bag.

### CAPSICUM ANNUUM

Annuum means annual, but strictly speaking this is incorrect since under the right conditions, these chilli plants can be kept for years. This variety of chilli is the easiest to grow. Most common chillies belong to this variety: Bell Pepper (paprika), jalapeño, cayenne pepper, Serrano and all "waxed" peppers. The flowers are creamy white.

### CAPSICUM BACCATUM

Baccatum means "berry-like". In South America, this variety is known as Aji. They have quite a fruity flavour. These plants can grow very large, and a height of 5 ft. can easily be reached. It may not be the most appropriate plant for indoor growing, but it is easy to grow, so very suitable for beginners! The flowers of this variety have spots on their petals.

### CAPSICUM CHINENSE

Chinense means "from China" but this is not actually true because the peppers originated in the Amazon region in South America and the Caribbean. The chillies that belong to this variety are of the hottest of them all: the habanero, Red Savina, Madame Jeanette and Scotch Bonnet. The C. chinense needs a humid environment, because they are a tropical variety. They grow rather slowly, need a relatively long summer and can take a long time to germinate. The leaves are rather wrinkled and multiple fruits develop at every node. Their aroma is also slightly fruity, similar to apricots.

## Chillies can be rated as follows:

From 0 SHU (like paprika) to 2,500 SHU  
[Tabasco sauce]  
From 2,500 SHU to 5,000 SHU  
[Jalapeño]  
From 5,000 SHU to 50,000 SHU  
[cayenne, tabasco, aji]  
From 50,000 SHU to 100,000 SHU  
[Rocoto]

From 100,000 SHU to 500,000 SHU  
[Scotch Bonnet, Habanero, Red Savina]  
From 500,000 SHU to 1,000,000 SHU  
[Naga Jolokia, Naga Morich]

USA Police pepper spray:  
5,000,000 SHU  
Pure Capsaicin : 16,000,000 SHU

16,000,000

5,000,000

1,000,000

500,000

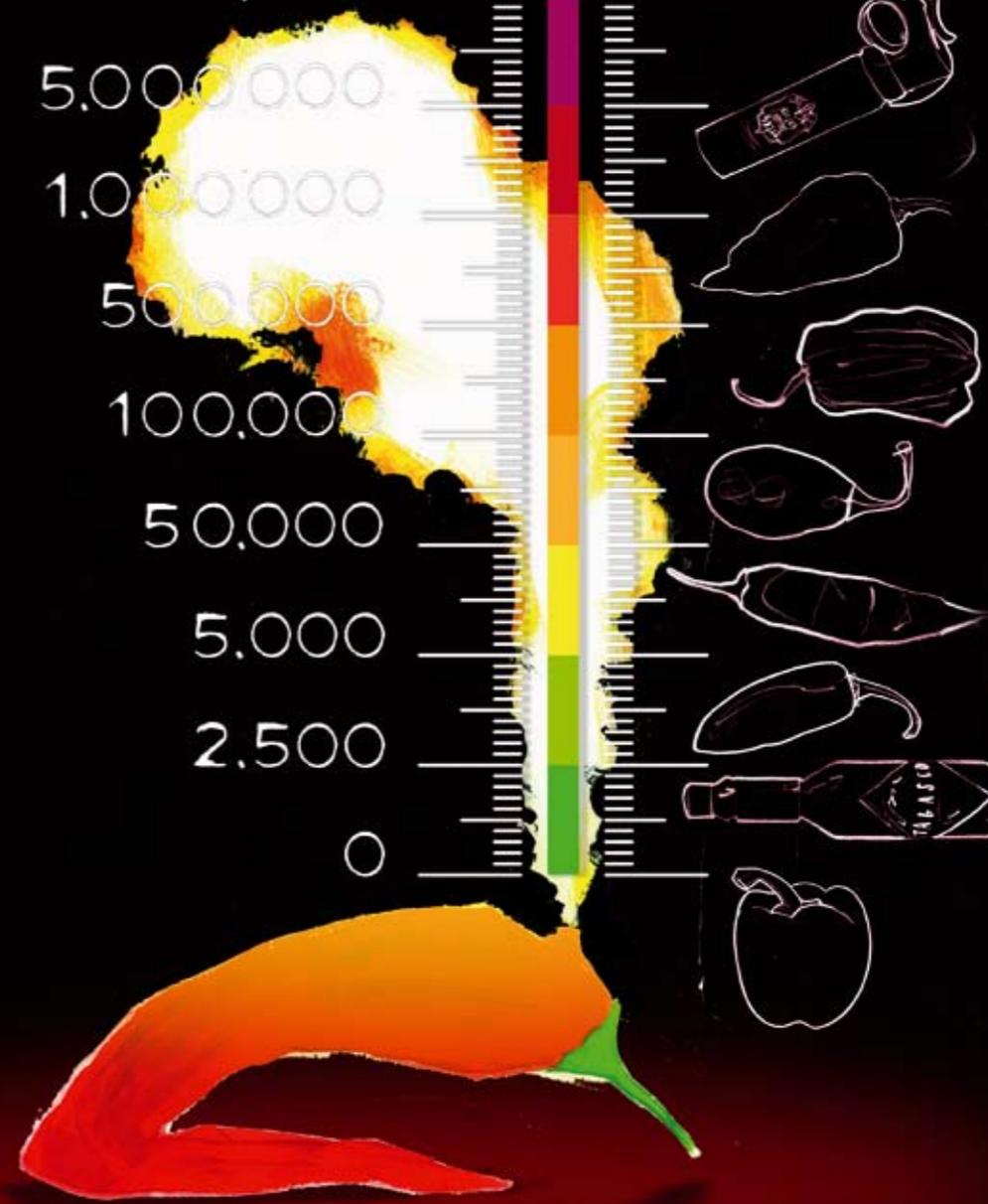
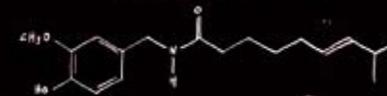
100,000

50,000

5,000

2,500

0





# Did you know

Chillies are full of vitamins.

One fresh medium-sized green chilli contains as much vitamin C as 6 oranges.

One teaspoon of dried red chilli powder contains your daily requirement of vitamin A. Hot chilli peppers burn calories by triggering a thermodynamic burn in the body, which speeds up your metabolism.

Chillies are not really 'hot'. Eating a chilli triggers the pain receptors located in your mouth, nose and stomach. These tell your brain that you've eaten something 'hot', so that it will flush your body with water. You break into a sweat, your nose starts to run and your eyes cry.

Chilli festivals are held all over the world. These festivals usually include chilli eating contests.

Chilli lovers are also known as Chiliheads.

In Samoa, the pepper is one of the ingredients of Kava, a love potion for virility.

# Hot or not?

As you may well know, the 'heat' in chilli peppers can actually be measured using special units called Scoville Heat Units (SHU). These measure the capsaicin in the peppers. It is the capsaicin that is responsible for the fiery sensation in your mouth and/or stomach.

It is measured as 1 part capsaicin per 1,000,000 drops of water (about 1 gram per 700 litres of water). This is rated as 1.5 SHU.

## CAPSICUM FRUTESCENS

Frutescens means "bushy" or "shrubby", which describes this variety quite accurately. The flowers of this plant are greenish. They are quite compact with many branches and grow from 1 to 4 ft. tall, depending on the weather conditions.

The most famous chilli belonging to this group are Tabasco and Bird's Eye chillies.

## CAPSICUM PUBESCENS

Pubescens means "hairy", and this also describes the plant quite accurately. The flowers of this plant are purple and the seeds black. Since they originated in the mountains, they can withstand colder conditions quite well. The peppers belonging to this variety are the Rocotos, which resemble sweet peppers - that's something to remember to avoid "spicy" mistakes! This variety needs a long time to grow and flower plus a great deal of light every day. Above all, the temperature margin for growing is limited, so, all in all, this is not really an easy crop to grow!

## Harvesting

Harvesting chilli peppers can be done in the same way as with sweet peppers: the unripe green ones can already be used for cooking. The red ones are ripe and will give you that fiery flavour. You can use chillies fresh or dried. When you dry them, put them in a warm and dry place, such as in a saucer on the windowsill. As soon as they are brittle, they are dried properly. After drying, they can be kept for as long as a year. Another way to conserve chillies is to freeze them.

## Cooking

When preparing chillies, you need to take some precautions to avoid irritating your hands or eyes.

When preparing chillies for your meal, it is better to remove the seeds. Watch out for your hands when doing this, because it is easy to burn them! Avoid any contact with your eyes too, as this can be very painful.

You can eat the chillies either raw or cooked, depending on your preference. Make a salad, a sauce or a soup and enjoy!

## Qualities

Chillies are also good for your health. They can cure a cough, relieve toothache and help with indigestion. They are also ideal for getting rid of a hangover! Eating chilli sauce with garlic can act as a painkiller.

## But beware:

- Consuming too many chillies can cause injuries to your stomach or intestines;
- The seeds of the peppers can be poisonous;
- When you use peppers as a compress, do not leave it on your skin for too long, otherwise you will get blisters;
- Do not allow children to put chillies in their mouth. •

# Puzzle & WIN great prizes



Puzzle time again!

Not only nerds and old people puzzle you know! After a hard day's working or growing (which may be the same for some of you out there) it can be pretty relaxing to just sit down and get your mind cracking over this puzzle. Above all your efforts may yield big prizes!!

We've selected a completely different puzzle this time: A large sudoku not only including the figures 1 upto and including 9 but also the letters a thru c.

## THE RULES

The rules are the same as with an 'ordinary' sudoku, meaning each row and column needs to contain the numbers 1 thru 9 as well as the letters a thru c. When you've composed the right solution into the coloured boxes, please let us know by sending an email to [editor@cannatalk.com](mailto:editor@cannatalk.com). We will let you know through the mail address you sent the message from if you're a winner! The prize you can win this time is one bottle of 1L CANNA RHIZOTONIC! So it is really worth your while!

## Solution puzzle #9

381276549

And the winner is....

We randomly picked a winner from all entries received and we congratulate

Mr. "Randall". We'll contact you to find out where you wish to receive your prize.

		6	4			9			b
		9		1				6	
7	a		c		b	5			4
				7			3	1	
b					a	3	5		
c	8			4	b		2		
	a	8	7		6			4	
5	3			a	4	c	2		
	6								a
8			1					5	6
		4	5	2			8		3
	5			c	8	1		7	

www.sudoku-puzzles.net

# WHAT'S NEXT

Next issue will again contain a lot of information, as you are used to by now. The central focus will be on coco. We tell you all about this most natural product, why it is a very favourite way of growing and which different types of coco products there are.

In the What's happening section we will focus on something very different this time: Tattoos!!

So there's plenty to read again in next issue. Don't miss it!!

## CANNAtalk

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**Editor:** Ilona Hufkens

**Email:** [editor@cannatalk.com](mailto:editor@cannatalk.com)

**Co-editor:** Bianca Bakkers

**Email:** [B.bakkers@canna.com](mailto:B.bakkers@canna.com)

### Contributors issue 10:

CANNA Research, Geary Coogler, Anton van Dongen,  
Lynette Morgan, Georgia Reschel,  
Pieter Klaassen, Myrthe Koppelaar, Mirjam Smit.

## CANNAtalk

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**CANNA**

The solution for growth and bloom

# CANNAZYM

**NEW  
FORMULA**



## CANNAZYM NEW FORMULA

CANNAZYM has been improved! While it still continues to be the only enzyme product targeting the underlying cause of root binding, old cast-off and dead root material, the new formula made some major changes. New formula CANNAZYM increases the activity of enzymes on cellulose while decreasing the time it takes to work. CANNAZYM is now a darker shade of liquid from the increased concentration of enzymes. It now boasts a better resistance to temperature extremes, which prevents destruction of the enzymes. Best of all, it now has an extended shelf life. All this means a better product all around. For more information, or to obtain the evidence of this products' effects, visit our website or your local gardening center and download or pickup the New CANNAZYM leaflet.

**CANNA**

The solution for growth and bloom