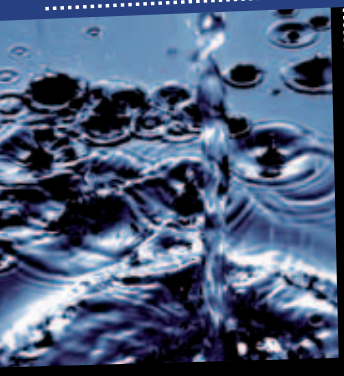
CANNAtalk®

MAGAZINE FOR SERIOUS GROWERS

ISSUE 12 2011

Hard & Soft Water

What is it

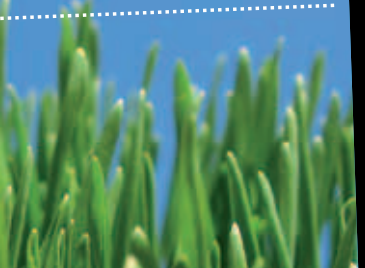


Tattoos

Getting ink done

BARLEY GRASS

Superman amongst foods



And more:

- EC by CANNA Research
- Grower's talk
- Product Flash
- Questions & Answers
- Grower's Tip
- Factographic
- Puzzle & Win

HQTalk:

The winter is over now and we can smell the spring in the air! The growing season has started and our thoughts are turning again to how to get the best results from our crops! Here at CANNA HQ, we haven't had time to hibernate. 2011 has seen some huge natural disasters especially down under, where they've been hit hard by floods and a terrible earthquake. Naturally, our thoughts are with the people in the affected areas.

Issue 12 of CANNAtalk tells you everything you always wanted to know about water.
We have a research article on hard and soft water and how to deal with these different water types! It explains exactly what hard and soft water are, and how you need to take this into account when feeding your plants. We also have an article about electrical conductivity - what is EC and why does it matter? Of course, you'll also find our regular features, such as Growers Talk, Growers Tip, Product Flash, and Q&A. This month's Grow it Yourself feature tells you all about barley grass, a very nutritious crop that's packed with vitamins, minerals and proteins. For the whole story, please go to page 12.

As the producers of this magazine, we'd like to know where your interests lie. Which aspects of cultivation do you need to know more about? And what do you think of the magazine as a whole?
So please don't hesitate to fill out the answering card at the back of the magazine or contact us via the website on www.cannatalk.com. We'd love to hear your feedback!

And remember... the more you read, the more you'll know!

Karin

Contents

HARD WATER SOFT WATER WHAT IS IT AND HOW DO I DEAL WITH IT?

ALL OVER THE WORLD, THERE IS DEBATE ABOUT THE EXACT DEFINITION OF HARD WATER AND SOFT WATER, AND HOW THIS SHOULD BE TAKEN INTO ACCOUNT WHEN FEEDING PLANTS. THE HARDNESS OF WATER DEPENDS ON THE CONCENTRATION OF POSITIVE METALLIC IONS DISSOLVED IN THE WATER, TYPICALLY CALCIUM AND MAGNESIUM.

By Geary Coogler, B.Sc. Horticulture

This effect can be heightened by the presence of dissolved carbon dioxide (CO2) in the water as carbonates or bicarbonates. 'Soft water' can be defined as 60mg/l, and water with over 120mg/l is considered to be 'hard', while water in between is defined as moderately hard. However, different agencies have their own definitions (See Table 1).

Hard water, soft water, bad water... what's the difference? Anything dissolved in water can and will react with other elements that are added to the water, or with anything that the water comes into contact with. Hard water is an issue for cleaning and equipment, and it increases the chemical reactiveness of the water especially as far as pH is

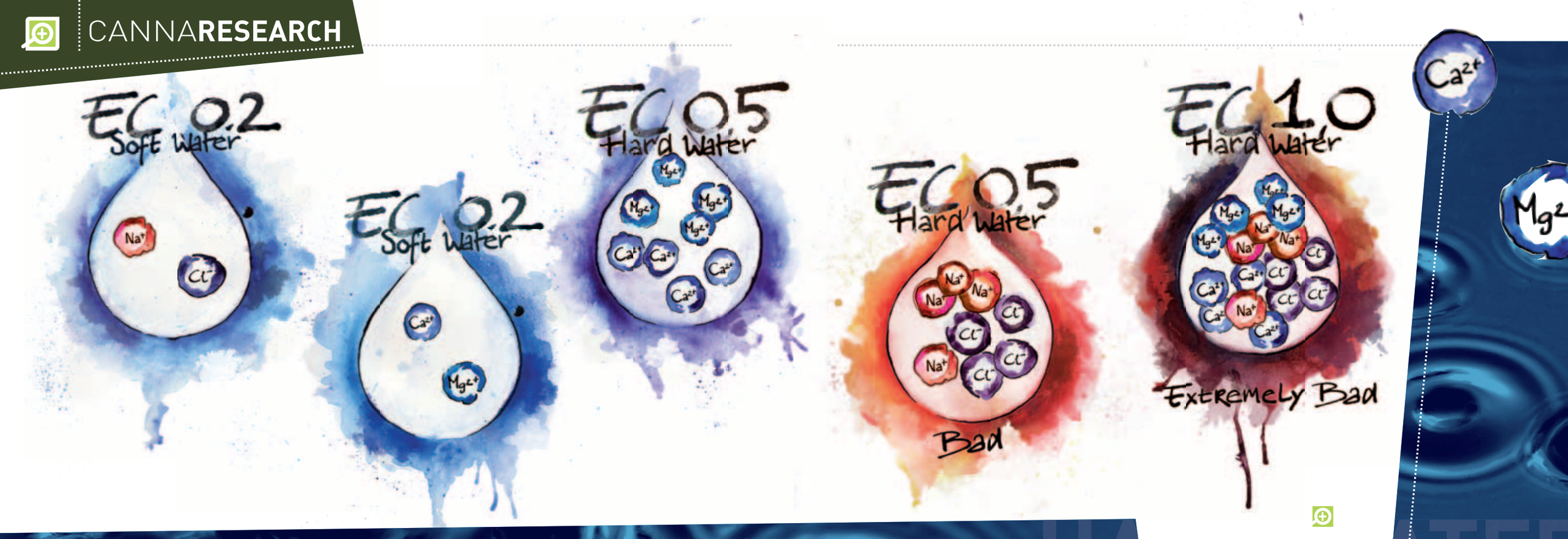


Figure 1: **The EC value doesn't always tell everything about the quality of your water. Sometimes hard water with an EC of 0.5 could still be okay, while different water with the same EC could be bad or extremely bad for your plants, because it contains different salts and chemicals.**

concerned; it is often considered healthier. Typically, hard water comes from ground water that has been exposed for longer periods to mineral-bearing rocks. Well water is a prime example.

Soft water on the other hand allows soap to foam up and work better. It affects equipment less, and provides more of a 'blank slate' for chemical reactions. Studies have shown a correlation between soft water and health issues including cardiac disease. Soft water is typically sourced from surface water – rivers, streams, and lakes – and has not been exposed for long periods to mineral bearing rock formations. It can also come from treated water, where most ions have been removed or replaced with single valance atoms such as sodium by water softening equipment.

Problematic ions

Bad water is simply bad – because it contains high levels of salt or other undesirable chemicals, for example. It can be found anywhere especially in industrial areas, regions where there is intense agricultural activity, or close to bodies of salt water. This has no bearing on whether it is hard or soft.

It's important not to confuse ion or salt concentration with the hardness or softness of water. Hardness is a function of multivalent ions such as Ca2+ and Mg2+, not monovalent ions like Na+ or Cl+. Monovalent ions also show up in the total dissolved solids (TDS) of a solution, so it is possible to have a TDS of 450 mg/L (1 ppm = 1 mg/L), derived from adding table salt to distilled water, but this water can still be soft. There is no direct correlation between TDS or electrical conductivity (EC) and water hardness. You can only be sure that the water is hard if you can know that all the electrical conductivity derives exclusively from Ca, Mg or other multivalent metallic ions. For example, sugar solution will conduct electricity, but is not (necessarily) hard. Water softeners work by replacing the problem ions – calcium and magnesium – with sodium ions. The EC stays the same or increases but the water goes from hard to soft; not a good thing for plants.

For us, the big question is how all this affects plant nutrition. One of the biggest effects for growing systems that use hard water is the potential for a build-up of calcium carbonate or magnesium carbonate, which are insoluble. The formation of these deposits is an endothermic reaction, meaning that the process gets faster as heat is supplied to the solution. During the process of pumping water from a reservoir, through a pump, through smaller pipes, onto a table top and through a root system, the water will become warmer, and this will cause the deposits to form naturally and persistently.

Reduced flows

As the heat enters the system, the formation of calcium or magnesium carbonate increases, resulting in the deposition of insoluble materials on the inside of pumps, pipes, tubes and the medium of the growing system. Ultimately this leads to restricted flows, blocked emitters, burnt-out pumps, and so on.

The effect of the nutrient package on the chemical profile of the water can also be altered by various antagonistic relationships between individual elements and the overall effect on pH. The harder the water, the more calcium and magnesium is available. The more of these elements there is in relation to certain other elements, such as potassium and phosphorous, the less available those elements become, so they are effectively locked out. These positive ions will raise the pH of the solution, and when hardness is also affected by carbonate levels, the pH effect will

Table 1. Recommended upper limits of chemical factors in irrigation water for greenhouse crop production (Based on 1 and 2, see bibliography)

Ph		5.4 to 6.8
Alkalinity	Total alkalinity	150 mg/l
	Bicarbonates	122 mg/l
	Hardness (Ca + Mg)	150 mg/l
Electrical Conductivity		
	Seedlings	0.75 mS/cm
	General Production	1.5 mS/cm
Total Dissolved Salts (TDS)		
	Seedlings	0.69 mS/cm
	General Production	1.37 mS/cm
Sodium Absorption ratio		
Sodium (Na)		1.5 mmol/l
Chloride (Cl)		1 mmol/l
Nitrogen (N)		
	Nitrate (NO_{3-})	0.16 mmol/l
	Ammonium (NH_{4-})	0.03 mmol/l
Phosphorus (P)		0.02 mmol/l
	Phosphate (H_2PO_4)	0.1 mmol/l
Potassium (K)		1.5 mmol/l
Calcium (Ca)		0.3 mmol/l
Magnesium (Mg)		0.41-0.62 mmol/l
Sulphur (S)	Sulphate (SO_4)	0.31-0.47 mmol/l
Iron (Fe)		3.6-71.6 µmol/l
Manganese (Mn)		18.2 µmol/l
Boron (B)		46.2 µmol/l
Copper (Cu)		3.1 µmol/l
Zinc (Zn)		4.6 µmol/l
Fluoride (F-)		52.6 µmol/l
Aluminium (Al)		185 µmol/l

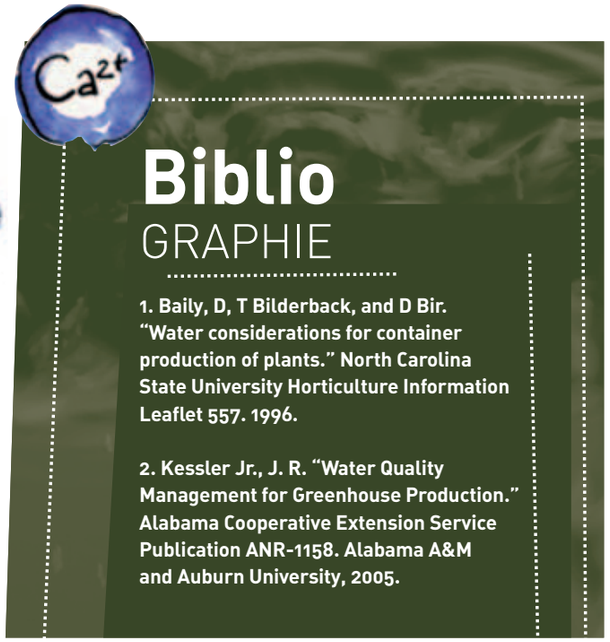
The values can vary by EC meter. Here we have used the Truncheon Meter to calculate the values.

continue into the medium which it is applied to. The harder the water, the more acid is required to lower the pH.
There are a number of commercial solutions to moderate levels of hardness. The first is water softening. Water softening involves flooding the water with a monovalent ion, typically sodium, which drives out the calcium and lowers the hardness of the water. This is great for washing clothes or taking a bath, but not so great for water that you are using to supply your plants or for human consumption, especially when the water is very hard to start with.
The next method is reverse osmosis (RO), a process by which tap water is forced through a series of membranes with progressively smaller pores which block molecules and atoms over a certain size. This filters out the calcium and other larger elements effectively lowering the hardness of the water. It also strips out most other elements including harmful molecules, sodium ions, and most other ions thus effectively lowering overall total dissolved solids and EC. However, it is also expensive to install and maintain and not always completely necessary – at least, using pure reverse osmosis water is unnecessary.
Good suppliers of nutrients should take the issue of hard or soft water into account when designing their products. Different types of cultivation have different requirements in this area. Most of these differences are influenced by the medium which the product is applied to. Potting mixes have a greater buffering capacity, can retain elements, and the water should not be recirculated. Recirculation adds more heat to the system and allows deposits to form more readily. Potting mixes have natural buffers that reduce pH changes. The difference in content should be adjusted by using the correct ratio of nutrients, which will be present in a fertiliser developed especially for use with potting mixes.

Water sample

Only soft water is recommended for recirculation, and only when an inert growing medium is used. This can be done with pure reverse osmosis water, for example. Recirculating systems must be able to adjust not only to the hardness of the water, but also to the additional elements supplied in the tap water over and above what is added or needed in the nutrients added. Controlling salt composition is critical because this also affects pH levels, which are critical in signalling a plant's flowering response (in addition to photoperiod change). It is best to use a nutrient which is designed to work with tap water with EC values no greater than 0.3 – 0.4 mS/cm while providing some buffering for pH control in the system (for example CANNA AQUA).
Another method used in growing systems is the run-to-waste system where tank-mixed nutrients are applied to the plants and the excess is allowed to drain away and not re-captured. In this system, it is important to not only regulate the pH when mixing it, but also to maintain the pH over time while the prepared product is stored in the tank before use. This minimizes pH swings while preventing insoluble compounds from forming. Also, there are less calcium and magnesium ions available in soft water, so those need to be augmented or replaced to achieve the correct ratio of ions.
If you want to avoid worrying about nutrient composition, you should choose a nutrient that has both a soft water and hard water versions (for RTW) (like CANNA HYDRO). How do you know whether to use the hard water or soft water version? Simple: run a water sample and compare the results with the table above.

So, what can you gain by knowing about hard and soft water? Now you can appreciate that there are many aspects affecting water quality. Not only is the total amount of dissolved ions important, but also the ratio of these elements to one another, the effect they have on the nutrient package that you add and the post-chemical reactions that can and will occur. Ultimately, all this will affect your plants. Nutrients have to be designed and adapted according to the water that the grower intends to utilize as source water. In the end, it is also designing an appropriate nutrient package that allows for the plant's nutrient requirements, the long-term effect on plant development, and the effect of the growing medium on the composition, storage, and reactivity. Testing is knowing, and knowing is growing... how much do you know? •



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Questions & Answers

We receive a lot of questions from growers and even CANNAtalk readers through the website **www.canna-uk.com** requesting our help in resolving issues they are experiencing in growing their crops. As always, our R&D department is more than willing to answer them!

Question

I'm using the product calculator for food on your website and the table recommends using CANNA Aqua Vega and Aqua Flores etc. for use with a recirculating system, and it shows the quantities you should be using. However, it's not clear to me whether these quantities should simply be added to the reservoir, or are you expected to empty the reservoir and start with a fresh batch? And when it states vegetative state growth (1-3) weeks, are the quantities per week or are they spread over the whole of the phase? Please advise. Thanks. AC

Answer

The recommended doses shown on the product label relate to a clean tank of water. In a recirculating system, you should renew the tank every two weeks or when changing from one phase to another. Between changes, you only add water to reduce the EC, or add feeding solution to correct the EC. You can also correct the pH if necessary. If you have to add feeding solution, (which is unusual by the way), you'll need to calculate exactly how much is needed. You have to renew the tank at regular intervals of two weeks, when changing from phase to the next, or when the tank is almost empty (30% or less). Discard the old feeding solution and start all over again with a fresh tank.

If you don't refresh the solution, the roots will absorb certain elements which over time can kill the plant. So our recommended amounts relate to fresh clean water or when you change the tank size, for that amount of water.

Question

Can anybody tell me why the NFT advice is to run the pump 24/7?

Answer

When using an NFT system, you always use dry substrates or none at all. Dry substrates, such as clay pebbles, hold hardly any water, meaning that the roots always pump in a mechanical manner to keep themselves moist. Dry roots die and cannot absorb any water or nutrition.

To keep the moisture level around the roots stable, they need constant watering 24 hours a day. The dry substrate, the pot and the rest of the system determine the frequency of dripping.

Question

Is it okay to spray with a weak solution of RHIZOTOTONIC through the whole veg phase?

Answer

Yes it's no problem to use CANNA RHIZOTONIC as a leaf-spray, but only until the generative period.

If you use it for too long, the leaves will become too large and weak. If you want to use a leaf-spray in the generative period, please use CANNABOOST, if still needed, until flowering week 5. After that week, stop using the spray.

Question

I was told by the store where I purchased my CANNA products that I should not use the CANNAZYM product for the last two weeks in my garden because it is outside in large beds. They explained to me that the dosage was designed more for container soil growing and not really suitable for field production. Also, because the soil outside is conditioned by weather and has complete drainage, worms, and cover crops are grown annually. They said too much enzyme would affect taste and colour if used during the "flush" cycle, the final 1-2 weeks. I used the grow calculator with tank size and it says to use "CANNAZYM" during that period. One other plant store suggested that I use it at half strength. I am also breeding worms in these beds and I add microbiologicals (worm/compost teas) as well as mycorrhizals so there is quite a bit of enzyme activity in the soil already. I am primarily concerned with soil health and quality of the crop. Thanks for any help.

Answer

CANNAZYM will not interfere with anything other than cellulose, inside or out, containers or beds. These enzymes are the same as those found in natural conditions. The one thing we have noted is that better levels of enzymes are found in less cultivated soils. Levels found are always higher under stable, older forest stands, while they are much lower (as low as close to zero) under continuously cultivated farm lands. Cultivation interferes with the addition of fresh material for decomposition and there is less food available for life forms. There is also a loss of physical characteristics that affects types as well as other pressures from different life forms. What does this mean? Well, if I were turning my bed between crops or even yearly, I would continue to use CANNAZYM. If the beds were left unturned, then I would not worry so much about using it. CANNAZYM is made for the more sterile conditions of modern agriculture in containers or beds. It is made for cellulose only, which is not attacked directly except by some specific organisms. Mycorrhizal fungi do not attack cellulose – in fact few things do, and most of them are specific so they only cause certain steps in the process of cellulose break-down.

Question

Hello, I'm using BIOCANNA right now and I was wondering if I can use BIOCANNA in recirculating systems or drip systems. Or is BIOCANNA only for drain-to-waste? When flowering, how and when do you recommend using PK 13/14 and BIOBOOST? And what if I want to use an organic PK 13/14? Will BIOBOOST still work? Thank you so much I hope it is not too many questions. Hope to hear from you soon.

Answer

No, sorry, BIOCANNA, like every other true organic product will only work under the influence of a root zone and medium, including other biotics. There are many reasons for this, some complex and some simple. A lot of research is being done to look for other methods, but nothing has been found so far. You can try other PK products but you would have to ensure that they are all 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 you would have to apply them separately far enough ahead of them being needed in order for them to be effective. If you are intent on maintaining a total organic product, then you have to be willing to work with nature. This could mean a smaller harvest and better planning, but the quality will be higher.

Question

I have used your COCO coir with the COCO A+B nutrients (drain-to-waste) with great success. I am about to use your COCO in my recirculating system, which has top feed pots filled with clay pebbles and a layer of coco. Since this is a recirculating system, should I use CANNA AQUA? Or could I get away with the regular CANNA COCO nutes? I check pH daily, top off with plain water, and do a weekly reservoir change. I would prefer to use CANNA COCO nutes because for a portion of my other crops I still hand-water and drain to waste.

Answer

This is a difficult question. If the amount of COCO medium used is below 50% then yes... maybe. We don't recommend using coco in a hydroponic system. The nutrient is designed to work with the medium in a RTW (Run-to-Waste) application. Anything else is guesswork at best. AQUA is designed to provide long-term fertility in a solution that is passed through the root zone repeatedly. There is a pH buffer in it that helps the grower to maintain pH levels but will not work as well with an active organic medium such as COCO. The question is, at which point does the system starts working more as coco or hydroponic? Making an educated guess, with less than 50% coco medium, you should probably use COCO A/B, and AQUA below that. Keep a close eye on the pH and results and you may need to change the nutrient, the water cycle, the pH, the concentration, or all of them!Keep an eye on it, because you may need the Cal-Mag around that time. If it is a better mix like our CANNA Terra Professional Plus or a decent medium like Fox Farm, then this will be much less of an issue. Finally, do not forget to switch to Hydro Flores A and B when flowering starts. An InfoPaper is available for download online which is really helpful in understanding this process and includes tips addressing particular issues seen over the years with HYDRO.

GrowITYOURSELF

BARLEY GRASS: Emerald superfood

Barley grass could well be called the superman amongst foods, the young emperor of health. A bright green supercop to ward off high cholesterol levels and even kill off carcinogens, we're told. Not bad for a baby! Let us show you the wondrous world of barley grass. Let's juice it! **Text: Marco Barneveld / www.bqurious.nl**

Heaps of History

It must have been a massive, life-changing discovery about 9000 years ago when the inhabitants of what is now known as the Middle East started cultivating barley. Barley, or hordeum vulgare is derived from a wild species similar to Hordeum spontaneum, which is common occurs widely in Turkey and Syria. For the first time, man was able to grow a steady supply of food on the same spot. No more hunting. No more relentless travelling around. Barley was probably the first cereal grain to be cultivated by man. And since barley grass is nothing more than baby barley before the ovule has begun to move up and the grain started to develop, barley grass has actually been around even longer. written crop reports have been found in Egypt dating back to 2440 B.C. Those Egyptians and also the Greeks, knew the importance of the plant they suspected it was a gift from the gods and revered it as a sacred grain. Its cultivation spread rapidly around the globe. The Chinese were cultivating barley in 2,000 B.C. and it was also one of the first crops to be planted in the new-world colony of Virginia in 1611.

In the Pulitzer Prize-winning book Guns, Germs, and Steel, Jared Diamond argues that the availability of barley, and barley grass, is one of the main reasons why Eurasian civilizations have survived and conquered others. Since biblical times, ancient Asian and Middle Eastern cultures reportedly included barley grass in their diets. Historically, the young plant species were used to treat the skin, the liver, the blood, and gastrointestinal disorders. Ancient Greeks used it to treat gastrointestinal inflammations. Gladiators in Rome ate barley grass for strength and stamina. The Roman physician Pliny used barley grass as part of a ritualized cure for boils.

BARLEY GRASS:

Emerald superfood

Neatly nutritious

Ilt took a while for science to get to the bottom of the nutritional value of barley grass and other cereal grasses, though. But in 1940, nutritionists finally explained how the vitamins, minerals, and protein in cereal grasses like barley grass are essential to animals and humans. The Council of Foods of the American Medical Association approved a dehydrated preparation of cereal grass called "cerophyl" as an "accepted food" in 1939.

The true nutritional benefits are found in the young grass leaves. These leaves contain many of the vitamins, minerals, and proteins necessary for the human diet. Barley grass is considered a whole food concentrate that is close to its natural state, supplying the nutrients we require in natural proportions.

So you want to know how nutritious baby barley is? Ready? The juice of barley grass contains eighteen amino acids. Amino acids like these are the building blocks of proteins, which are the major constituents of our body and necessary for the continuous processes of cell building, cell regeneration and energy production that are part of living. The vitamins found in barley grass include beta-carotene, folic acid, pantothenic acid, vitamin B1, vitamin B2, vitamin B6 and vitamin C. The minerals include potassium, calcium, magnesium, iron, copper, phosphorus, manganese and zinc. Along with all that, you get lots of live enzymes, one of which is the anti-aging enzyme called superoxide dismutase (SOD). SOD aids digestion and metabolism by helping to disperse vitamins and minerals into the blood stream so that they can be absorbed by the body. Neatly nutritious, no?

The green magic of chlorophyll

The bright emerald green of the young grass reflects the abundance of chlorophyll in the plant, as in other dark leafy vegetables. Chlorophyll, which is an inherent component of all green plants, is very similar to haemoglobin. In fact, their molecular structure is nearly identical. This similarity makes it easy for the body to assimilate. Haemoglobin is substance that oxygen binds to in the blood to be carried around the body, and chlorophyll actually boosts the haemoglobin count in the blood. More haemoglobin means more oxygen-rich blood.

So chlorophyll actually aids in the rebuilding of the blood stream. For example, animals with a low red blood cell count that were given wheat grass had a healthy level of red blood cells within five days. It also prevents bacterial growth in the digestive tract as well as the production of yeasts and fungi. Chlorophyll eliminates bad breath and acts as an internal body deodorant.
Chlorophyll and other essential nutrients act synergistically in barley grass to detoxify the body from destructive toxins such as the heavy metals and pollutants that we ingest every day. Chlorophyll also has anti-inflammatory properties.

Active antioxidant

But the health benefits don't stop there. Barley grass is also an extremely powerful antioxidant. It has the ability to scavenge free radicals. Reactive oxygen species have been shown to play an important part in mediating the production of pro-inflammatory cytokines and can be instrumental in the pathogenesis of diseases such as rheumatoid synovitis, arthritis, and gout.

Chasing cancer

Are we done yet?
Definitely not! The really big one is that barley grass protects human tissue cells against carcinogens. The exact mechanism at work is unknown but it may be associated with the plant's antioxidant activity or its chlorophyll content. It has been suggested that complexes may be formed between the carcinogen and the chlorophyll that may de-activate carcinogens. In addition, antioxidants, including superoxide dismutase, found in high concentrations in green barley juice protect against radiation and free radicals.

Smooth recipe for health

This green smoothie is loaded with nutrients and tastes great!

– 2 bunches of spinach
– 1 bunch mint leaves
– ½ peeled cucumber
– 1 cup fresh pineapple
– 1 cup frozen pineapple/peach/mango
– 2 large ripe pears
– 2 cups water
– 2.9 cl barley grass juice

Blend it and down it! To your health.

Anything else?

So, is that all? Almost. Research in Japan and other countries suggests that barley grass can also help against asthma, obesity, skin rejuvenation, anaemia, arthritis, gastritis, peptic ulcers, diabetes, cellular damage from x-rays, heart disease and hepatitis.

The dreadful downside

So, what's the catch? I mean, it can't be all good can it? Well, you are right. There is a downside. Some taste buds might not appreciate the taste of the green, slightly bitter juice. That's all? Yep, that's all. There are absolutely no known side effects to this superfood. So, once again, let's juice it for a healthier life!

Grow it yourself!

There is one other thing. Barley Grass powder is not cheap. However, it's very simple to grow it yourself!
Put barley seeds in water to accelerate germination.
After 24 hours, put the seeds in soil in a pot.
Put the pot in a warm and bright area to stimulate growing. Water the seeds daily.
During 14 days, they will grow about 20 cm, with 100 grams of seeds producing about 100 grams of grass.
Process the grass in a blender 100 - 200 grams of grass + 1/2 litre of water. Filter the juice and dilute it with 1/2 - 1 liter of water. Ready to go! •

The eruption of **boiling water**

DID YOU **KNOW....?**

- ...the Strokkur geyser shown in the picture is located in Geysir National Park in Iceland? It erupts every 5-8 minutes and the jets of water reach a height of some 30 metres (98ft).
- ...the photograph shows a jet of boiling hot water which froze immediately as it erupted because of the extremely cold ambient temperature?
- ...most natural geysers have been destroyed to generate geothermal energy? Around 10,715 megawatts of geothermal energy are now generated worldwide.
- ...water from geysers and hot springs has been used to grow tropical fruit in geothermally heated greenhouses since 1920? The fruit could not otherwise be cultivated in Iceland's inhospitable climate.
- ...geothermal energy is not only used for heating greenhouses, but also for heating homes, streets and parking garages, drying fish and wood, and baking bread?
- ...microorganisms can thrive in those hot springs, despite the extreme temperature of over 73°C Some of these organisms can even survive at temperatures higher than the boiling point of water, 100°C.
- ...if you drop your clothes into some boiling geysers, they will look like they have been cleaned using bleach when you take them out again? The same microbes are used to create the stonewashed look on jeans.
- ...that microbes that live in geysers are used to help DNA matching in criminal cases, and also used for making artificial sweeteners?
- ...that these microorganisms are very valuable? One company has a contract with Yellowstone National Park to study batches of the bacteria in the geysers in return for some of the profits from marketing these bacteria.

A word from A GROWER

Growers TALK

I have been growing all kinds of crops and herbs indoors on Rockwool for years now. Although I used to be fairly satisfied with my yield I thought it could be better. After trying several brands over the years I finally decided to take a chance and try CANNA. I was told many times about CANNA but always considered it to be way too expensive. When I finally decided to buy CANNA AQUA A+B for both the vegatative and flowering stages to see if it would bring me satisfaction my disappointment could not have been bigger.

I decided I wanted to talk to someone from CANNA

Around week 5 of my cycle, the pH at the roots dropped. The leaves became really dark green and lustreless, and developed some brown rusty spots. Then later, the edges of the leaves even started looking like they had been burned and eventually autumn colours appeared, which usually only happens at the very end of their cycle.

At first, I tried to accept my loss and hoped for the best in the next grow. But I was kind of pissed off at CANNA for charging people this much for a lousy nutrient. I decided I wanted to talk to someone from CANNA - I felt like I needed to rant and rave a bit. I checked the CANNA website and found a question form. Although I would have preferred to phone them, I gave it a try. I filled out only a part of the form since not all questions were relevant, but at least I told them about the substrate and nutrients I had used plus my complaint. To my surprise, I got an answer the next day. They wanted some additional information like how I mixed my tank, if I was adjusting pH, EC values and the way I was watering to get a total view of the situation. I was sceptical at first and figured they would blame everything except for their nutes.

Again I received a quick reply. They explained to me that every substrate or system has its own characteristics. That wasn't news to me as I've been growing for quite a while myself. What I missed out on is that CANNA designs their nutrients for each system or substrate specifically. I bought their CANNA AQUA line which is designed for re-circulating systems while I am growing on a Run-to-Waste Rockwool system. That's where it went wrong. It is obvious that when you drain to waste, the nutrient should hold a different composition of elements opposed to when you re-use your feeding and it passes by the roots time after time.

For a run-to-waste system, I should have been using CANNA HYDRO. Ever since I started using that I haven't had any more problems. My plants look healthy and the fruits are amazing. I've finally found that extra something that I was looking for all those years. I judged CANNA too quickly after my first try. I'm so happy I contacted them and I occasionally still do if I have some questions.

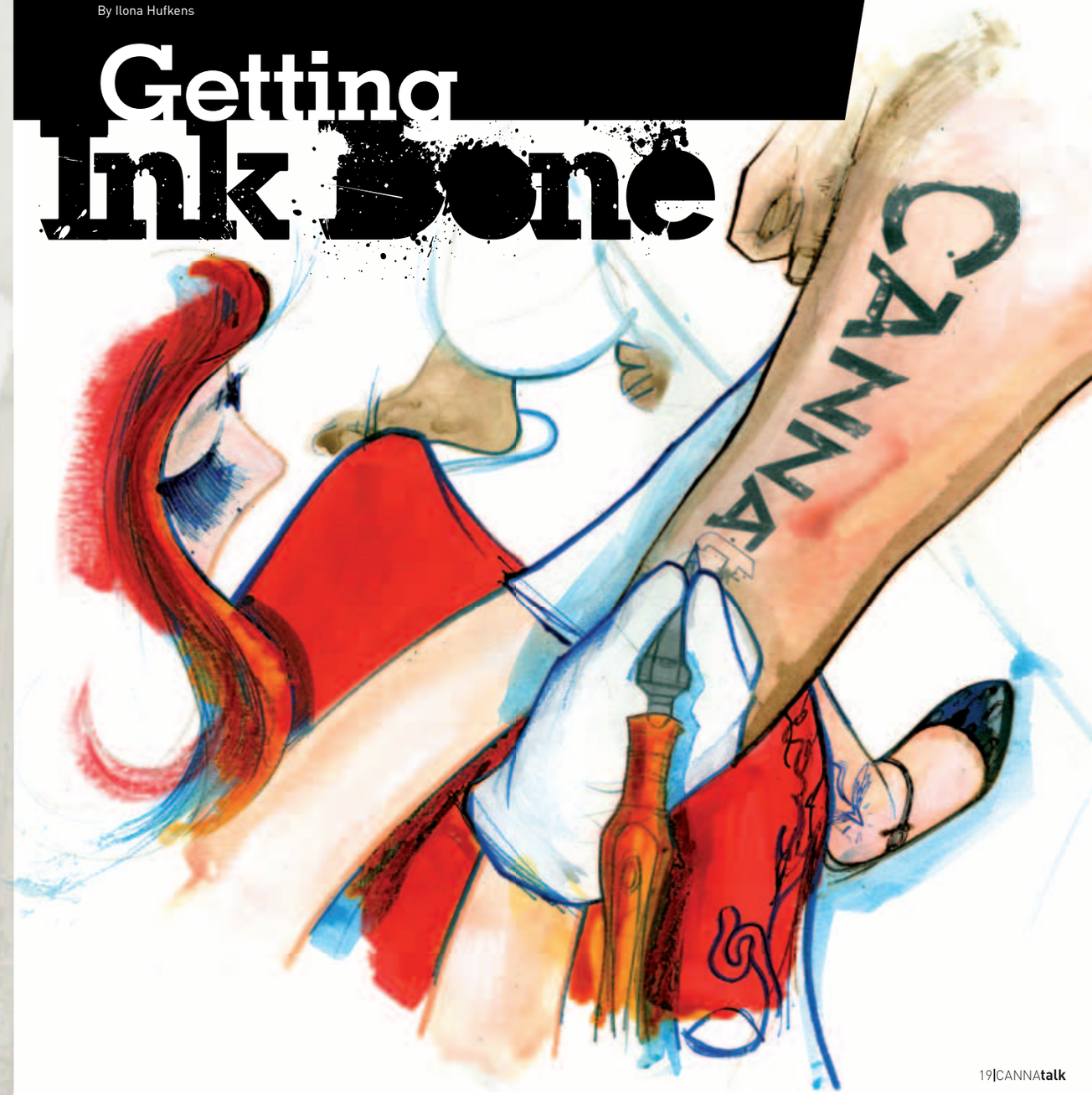
Cheers,
Aaron

What's HAPPENING

Looking for an authentically rebellious look? The time to accomplish that by getting a tattoo or belly button piercing belongs to the past. These days even well mannered business men and nerdy college geeks have some type of body art. Even funeral directors and fashion models turn up with more holes in their faces than nature provided. Body art and modification has become part of everyday society as they gained increasing prominence in the last decades. Although history goes way back and styles and designs are as diverse as the people wearing them.

By Ilona Hufkens

Getting Ink Done



As old as Ötzi

The word tattoo is believed to be derived from the Tahitian word tattau which means to hit or strike something. Tattoos have been around for ages, even up long before the start of our Common Era. Although no one knows exactly when this art began, tattoos were found on Ötzi the iceman, Europe's oldest natural human mummy dated around 3,300 BC with 57 tattoos on his body. It has always been a global thing. Many countries and cultures from Asia to Europe, to Africa and America all have a proud heritage of tattooing.

Fashion accessory

It is clear, that in a recent past tattoos, in our western culture, were often taboo, frowned-upon and seen as a radical branding. All that changed. Tattoos are all around you, but fueled by bands, celebrities and sportsmen they have become a fashion accessory. Acceptance has grown tremendously which triggered a shift to the visibility of them. When only a few years back you would have asked people who in the world has a neck tattoo? You could have narrowed the answers down to gang members, prison inmates, members of the Russian mob and the rapper Lil Wayne. But things changed. Permanent ink markings began creeping towards the traditional no-go zones for all kinds of people, past collar and cuffs. Probably also because it is being more accepted in the workplace now. Although we are still a long way from seeing facial tattoos on the selling floor at Bloomingdale's or the trading floor of the stock exchange for example.

Stars & TV

Many people have a tendency for wanting to look like their idol. While this used to be limited to copying a hairdo, now they wish to have the same tattoos. Or some will even immortalize their portrait on their own bodies. The popularity of TV-Shows has its influence too. TV is a mass medium reaching all kinds of people out there. Two reality shows in particular may be part of the reason that mothers for example who always saw themselves as conservative are now decorating their bodies. The TV-series "Miami Ink" and "L.A. Ink," are popular in a lot of countries and it emerged the series character Kat von D into a full fledged brand and an icon for her lifestyle.

Statistics:

Different studies have been done about the number of people with tattoos. Pew Research Centre for one showed that in the United States alone thirty six percent of ages 18 to 25 have at least one tattoo and forty percent of ages 26 to 40!
While fashion trends come and go, Search Engine Ask.com reveals that 'tattoos' have been stealing the scene as the number 1 search beauty term since 2003.
According to Search engine Lycos it is one of only seven search terms to never fall out of the top 50 and rarely drops out of the top ten. There are an estimated 20,000 tattoo parlors operating in the US and on average an establishment is being added every day. There's no mistake about it, tattoos and the tattoo industry are hot property!

Think before you ink!

Often a lot of time is spent on choosing the right design and the body location to get permanently branded. Strangely enough, lots of people don't take the time to choose the right artist. Which is very strange as the word itself is saying it....artist! It is an art and obviously not everyone can be equally good at it. Lots of tattooists have their own specialty and there is much diversity in different artists' skills. There are lots of idiots out there who think it is just putting a bunch of needles in your flesh and draw. These kind of tattooists are either only interested in making money or just not practiced enough to give good advice. Often resulting in a badly drawn tattoo with faded lines and color within a few years or even sooner. They often don't have a talent for what looks good (and stays good over time) on skin. Remember a drawing on paper can be very different from what it'll look like on skin. Realizing a tattoo is likely to be there forever, it is unbelievable how people just step foot in whatever parlor they pass by without looking into the artists' work, experience or specialties. Or sometimes people base their decision on which artist is cheapest. Come on! You don't want to have a horrible image and regret it the rest of your life, just to save twenty bucks, do you? A good tattooist advices you on what to do, looks good on your skin and refuses the design if he or she thinks it will, for example, be too small to keep it sharp and visible after a few years. Another million-time-made-mistake is that of getting Chinese characters without consulting a native. You end up having a character that says something different (or nothing at all) than what you wished for. Removing tattoos is 20 times more painful than getting them. So please, think before you ink! •

Getting Ink Done

Grower's TIP #12

By Geary Coogler, BSc. Hort

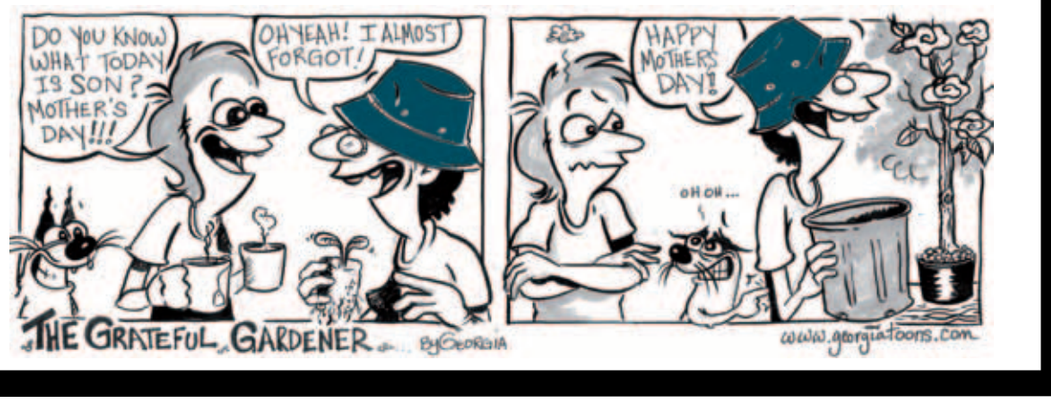
WATERING PLANTS

What is the best watering frequency for my plants? This is one of the most frequently asked questions in the industry and also one of the hardest to answer. There is no easy solution, but only one right one: when the plants need it! Both the frequency of watering and, to a lesser extent, the amount of water you need to apply, depend on many external variables which further complicate the issue. The grower therefore needs to maintain an 'eyes-on' approach in his or her growing techniques. However, below are some tips to help you on your way.

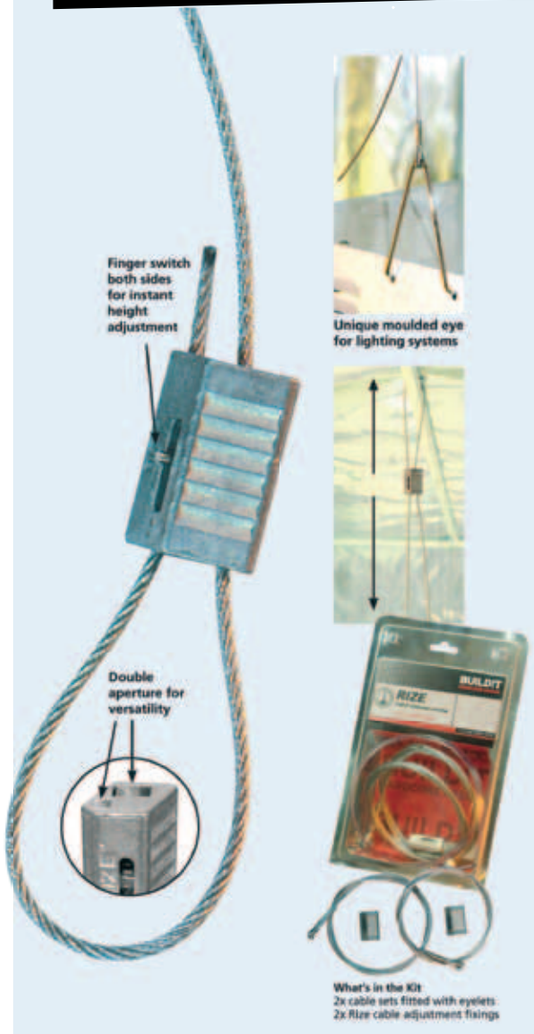
The general rule of thumb for determining the root health and irrigation needs of any system is that 1 square metre of bench top covered with leaves will use 4-6 litres of water a day. New plants, or leaf cover that does not totally cover the bench top, will require about 3 litres a day on average. This is true whether there are 2 plants or 20 within that square metre. Build your system to be able to supply this amount at each watering and for however long you want to go without mixing more. Use this figure to decide how well the plants are working. If they are using less water, the roots may be having a tough time, the humidity may be too high, the temperature may be too low, and so on. When figuring out a water cycle for a crop of more than one plant, base times on an average of all the plants. For instance, we want to water most mediums (except aeroponics) when about 50% of the total volume of the water is used or gone. Set automatic systems to turn on when 50% of the crop is ready for watering. To achieve this, maintain all variables at a constant: the medium, the age and size of the plants, exposure to light, air currents, and so on. This is important to ensure that the crops develop evenly.

If you wish to read more about this subject, read the article called "Thoughts on watering plants" in CANNAtalk issue 2 at www.cannatalk.com

The grateful gardener



Product FLASH



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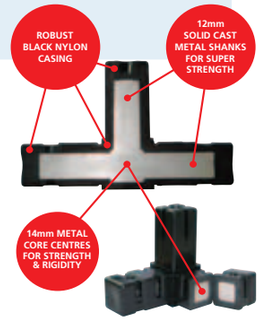

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BUILD!T HARDCORE DESIGN

EC ELECTRICAL CONDUCTIVITY

EC STANDS FOR ELECTRICAL CONDUCTIVITY, WHICH IS THE POTENTIAL OF ANY MATERIAL TO CONDUCT ELECTRICITY. ALTHOUGH MOST GROWERS ARE USED TO MEASURING THE AMOUNT OF FEED THAT THEY IN OUNCES PER GALLON, GRAMS PER LITRE, OR SOME OTHER UNIT OF MEASUREMENT, EC GOES A LITTLE FURTHER THAN THIS. IT IS IMPORTANT FOR GROWERS HAVE A GOOD UNDERSTANDING OF WHAT ABOUT AND WHY IT MATTERS.

By Pieter Klaassen CANNA Research

An EC meter measures the potential for an electrical current to be transported through water. This is known as molar conductivity (electrolytic conductivity) and is measured in siemens (S). Electrons are able to flow through the water from one set of electrodes to another not because of the water molecules themselves, but because of the ions dissolved in the water. It is these ions that transport the electrons. By the same token, the concentration of ions in the water also determines the number of electrons that can travel from one electrode to the other: the higher the concentration of ions, the greater the flow of electrons. Pure water is a very poor conductor of electricity, which is why an EC meter will read 0.0 in rainwater, reverse osmosis water or de-mineralized water. Salty seawater, on the other hand, is a much better conductor.

When we add nutrients (salts) to water, we increase the molar conductive potential for current through water and thus increase the EC value (or CF = EC*10). All conductivity measurements are directly affected by temperature and this must be allowed for when making them.

Unit

Electrical conductivity can be expressed using a number of different units, but the typical unit is siemens per square meter per mole (S/m2/mole) or millisiemens per centimetre (mS/cm). The mS/cm unit is generally used in Europe as a guide to the concentration of nutrients in water. In North America, conductivity is converted into a count of the ions in the water using parts per million (which can also be converted into units including mg/l etc.). This is done by converting the EC into a value based on the ions contained in the solution. Fortunately, there is a fixed calculation for the relationship between all these units, which is given in the table below.

Absorption

Salt has the property of making the water attracted to itself, a process known as hydrolysis. A pot of salt placed in a cellar will reduce the atmospheric humidity, for example, by attracting water from the atmosphere. In a solution, the concentration of salts will always try to equalize between two areas with different concentrations – in other words, the water will move to the area of higher concentration. This difference in concentrations is known as the water potential gradient, and it also plays a role in our cultivation through a process known as osmosis. Osmosis involves a semi-permeable barrier that allows water molecules to pass through but restricts the movement of the ions or salts in solution. When we dissolve many nutrients in water (producing a high EC), the nutritional salts attract the water in the substrate to themselves. This makes it more difficult for the roots to extract the water from the substrate. So it is actually possible for us to create conditions where the roots are no longer capable of extracting any more water from the substrate, even though the substrate is saturated. This is known as making the substrate "physiologically dry". The result is that no more water is available for the plants to cool themselves through transpiration (evaporation), which they need to do when heat and light are present. Even though this effect is commonly referred to as "over-fertilisation", it is actually the result of a shortage of water in the plant, with all the damaging effects of that. With cut flowers such as roses, or with plant cuttings, a higher EC in the vase or the plug for the cutting can literally draw the water out of the stems.

Salts

Water that contains mineral salts has an EC but the presence of EC alone does not necessarily indicate that the water contains nutritional salts that will help plants. Tap water can contain sodium and chloride, for example, which have an EC value but no nutritional value for plants. Fertiliser is made up of nutritional salts, of course. Any nutritional value that we add to water is known as EC+ and should be added to the water's residual EC. This is how we measure the total EC in our feeding tank. The nutritional salts are solids which have been extracted from the ground or released by an industrial cracking process. We dissolve a specific quantity of salts (in grams) into a specific volume of water (in litres), which means we can also use grams or litres for the EC unit. Although every fertiliser has its own fertilising value, it is possible to generalize and say that a solution with an EC of 1.0 mS/cm will contain up to 1.0 gram of measured salts per 1 litre of water.

	NIGHT						DAY						TOTAL
	2	4	6	8	10	12	14	16	18	20	22	24	0
Root pressure	0,40	0,35	0,30	0,30	0,30	0,30	0,40	0,45	0,50	0,50	0,50	0,50	4,8
Evaporation	0,20	0,11	0,08	0,06	0,05	0,04	0,76	0,70	0,75	0,75	0,75	0,75	5
Difference	0,20	0,24	0,22	0,24	0,25	0,26	-0,36	-0,25	-0,25	-0,25	-0,25	-0,25	
Stock	0,20	0,44	0,66	0,90	1,15	1,41	1,05	0,80	0,55	0,30	0,05	-0,20	

Shortage !

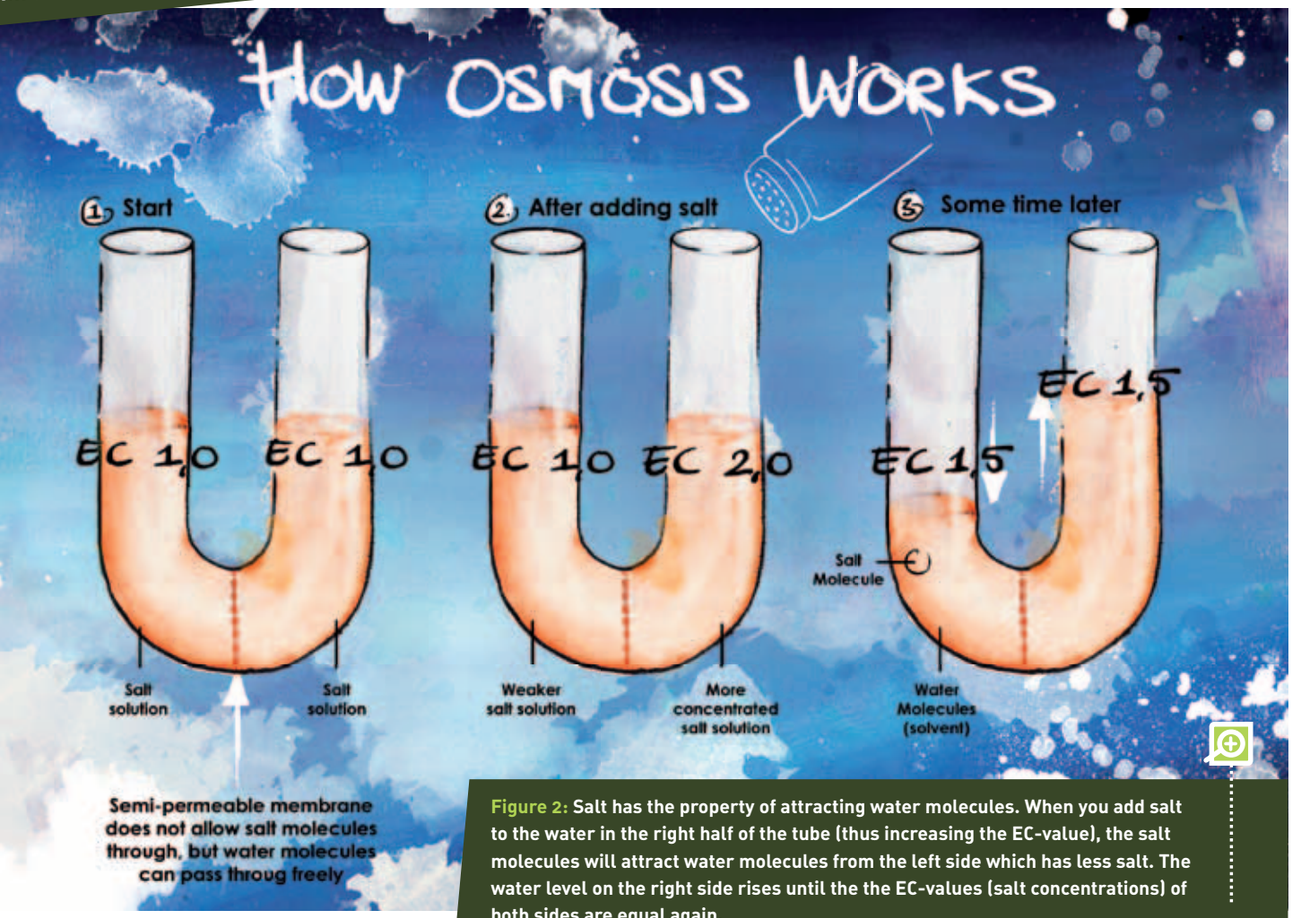

Figure 2: **Salt has the property of attracting water molecules. When you add salt to the water in the right half of the tube (thus increasing the EC-value), the salt molecules will attract water molecules from the left side which has less salt. The water level on the right side rises until the the EC-values (salt concentrations) of both sides are equal again.**

We can see this osmotic process in action a U-tube if we separate the two sides with a permeable membrane (such as a piece of stem). If we now add some salt to one side of the tube, the water level on that side will rise because the water with a lower EC (a lower concentration of salts) will be drawn towards it (see fig. 2). All this means that it is important to add little or no nutrients at the very start of the growing process.

Building up plant nutrition

Once the plant has taken up nutritional material from the feed solution, we need to try to build up the plant's osmotic value (or its internal concentration of salts) as quickly as possible. Because the volume of the plant increases as it grows and absorbs water, the osmotic value falls. The salts within the plant redistribute themselves and the plant becomes softer and lighter coloured. This makes it very susceptible to dehydration (wilting) because water can leave the plant easily. Giving more nutrition to the roots will show proportionally in the growth. Because the water that is used to transport the nutritional salts has evaporated, the salts will remain in the plant, raising its internal EC (osmotic value). This means that the grower can expose the roots to a solution with a higher EC again.

Strong plants

By achieving this positive spiral of EC build-up in the plant, the plant also becomes more capable of absorbing and retaining water. This means that water does not evaporate from the plant too easily and it will not dehydrate too quickly. The table on the bottom of page 25 gives an example of a plant that has lost its water reserves too soon.'When plants become too soft, the intensity of the light must be reduced or the number of hours of lighting shortened to prevent them drying out at the end of the day. Even though EC plays an important role in this story, it is not the only factor that has an influence. The overall climate around the plant influences the processes of which EC is a part.

Nutritional needs

When building up the plant's internal EC and subsequently that of the substrate, it is important to take into account the demands of the plant's growth. This demand is controlled by assimilation. The bigger a plant grows, the more nutrition it will need. These nutrients are partly locked up in the plant and converted into amino acids, oils, fats etc., but some nutrient salts also remain in the plant's sap and these determine the plant's internal EC. Potassium is one of the most important nutritional elements for this.

Once the plant has finished the vegetative growth phase, it can still absorb a lot of potassium for its internal osmotic value and the ovaries. The ovaries are not the fertilised "seed". However, this increasing rate of uptake comes to an end. After approximately 60% of the cultivation cycle, the plant will have taken up enough nutrients from the stock in the substrate. The game of nutrient stock versus applied EC now starts for growers.

EC stock in the pot

We can use the "bucket" principle to understand this game. (see fig. 3)

Example:

We have a bucket that contains 10 litres of fertiliser solution with an EC of 2 mS/cm.
This means that the bucket contains 20 grams of nutritional salts (nutritional stock). (2.0 g/l X 10 litres). If 9 litres of water evaporate, 1 litre of water remains, with an EC of 20 (EC = 20 grams of salt in 1 litre of water). In reality, such an extreme example would not occur and when cultivating in soil there is a further buffering process that binds the nutritional salts to organic substrate particles to some extent, but the principle is still valid.
Adding 9 litres of water will bring the EC back to 2 mS/cm. So, if we need to maintain the EC between 2 and 4 mS/cm, we have to replenish the water after 5 litres have been removed (4 g/l x 5 litres = 20 g, EC = 4mS/cm).
If there is a plant in the bucket and it has absorbed 5 grams of salts from the solution, we can top this up when adding the water in order to maintain 2.0 EC. If a top-up of 5 litres of water is required, for example, we should add 5 grams of salts, or to put it briefly: a water dose of 5 litres with an EC of 1.0 (gr./l) or mS/cm. The goal here, and in cultivation, is to maintain the EC in the bucket constant. This is the basic premise of fertilising. We try to maintain a certain level of fertility in the container which ensures that an adequate supply of nutritional elements is available to the plant. Generally speaking we should lower the EC in the final period. With a system that can be drained we can reduce the nutritional stock ourselves by rinsing out with a solution with a lower EC. The substrate in drainable systems can be corrected much more easily. In non-drainable systems, the nutritional stock can only be increased, and it is constantly added to with successive feed applications. Sooner or later, this nutritional stock will reach a level that slows, then stops the ability of the plant to take up water, and then actually causes water to move out of the plant's tissues, reversing the entire process.

Summary

As well as being a unit for measuring the fertiliser given to plants, EC is also a climate control mechanism that relates to water absorption.
Plants should start growing with a low EC, and this should then be built up as quickly as possible in order to provide for the plant's nutritional requirements as well as to raise the internal osmotic value to build a stronger plant.
The plant requires hardly any further nutrition in the final weeks of cultivation. We only continue to provide nutrition in order to maintain the nutritional stock in the pot and keep the EC stable. This generally results in the EC being lowered or even in a weekly rinse (leaching). •

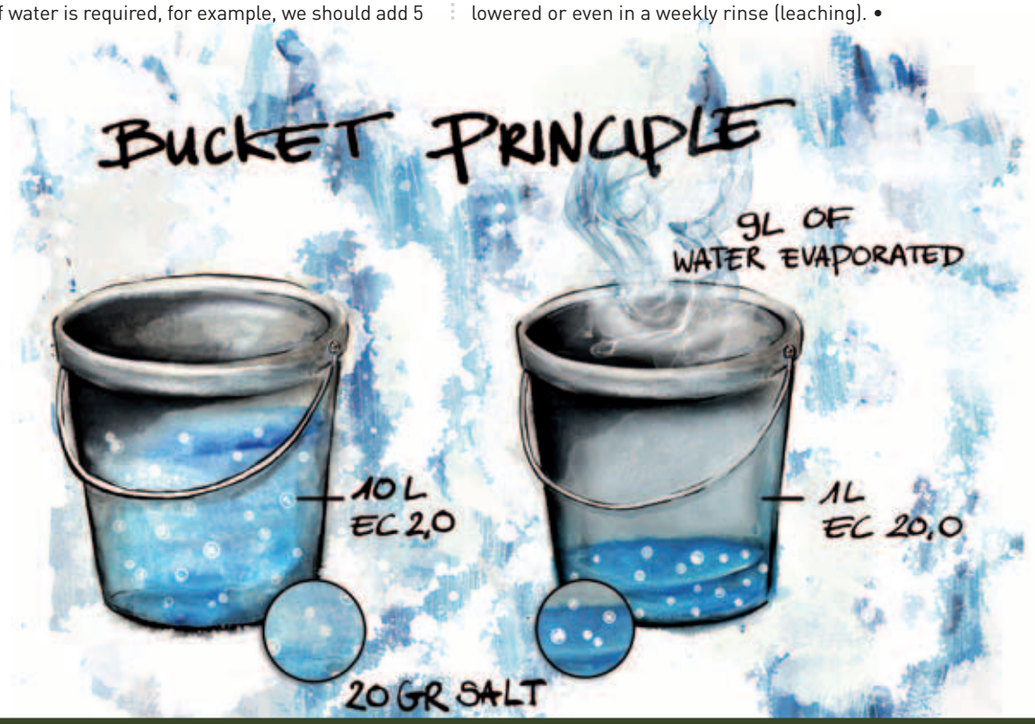

Figure 3: **While the water in the substrate will evaporate, the salts will not. So in the last weeks of growth, you should - in most cases - stop feeding the plant and only add water. Because if there's not enough water in the substrate, the EC-value (salt concentration) could rise dramatically.**

Puzzle&WIN great prices

Do the puzzle and let your plants guzzle…

Win a bottle of CANNA Aqua Vega and Flores!

There's nothing more relaxing than sitting back with a puzzle! Forget everything you're supposed to be doing and just focus on something totally pointless for a while. Well pointless... no puzzle is ever pointless when you can win a prize! So we suggest you take some time out to get those brain cells working and who knows, you could win a set of CANNA Aqua Vega A+B and CANNA Aqua Flores A+B. You can send us your answers either by email, at info@cannatalk.com or by writing the 5 differences down on the answering card on page 29. Have fun!!

Winner puzzle#11

We randomly picked 1 winner from all entries received and we congratulate

Mr. C. Renshalll

Congratulations!!

We will contact you as soon as possible to send your prices over.

WHAT'S NEXT

pests & diseases

What is the most devastating and disappointing thing that can happen while cultivating your crops? Exactly, pests and diseases! The next issue will be all about those pests and diseases that we all wish had never existed. Because keeping your crop healthy is so important, we have decided to dedicate a regular section to this subject in our magazine, starting in the next issue. The 'Pests and Diseases' column will stimulate your brain and increase your understanding with all kinds of information about pests and diseases.
Of course, the next issue will not all be about cultivating: re-live your youth with retro gaming in our 'What's Happening?' section.

CANNAtalk® is your magazine, YOUR VOTE COUNTS!

As in every issue, we want to thank you for sending us your comments and suggestions. We are very grateful to you. Not only do they motivate us to improve the magazine, but they also inspire us with new ideas and sources every time! So we just want to say THANK YOU guys! If you have any more comments or suggestions, please don't hesitate to send them using the answering card below (we'll refund the postage). Of course, you can also visit our website at www.cannatalk.com or send us an e-mail: info@cannatalk.com

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Solution to the puzzle:

#12

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