

CANNAtalk[®]

MAGAZINE FOR SERIOUS GROWERS

ISSUE 14 2011

LIGHT & Flowering

Red and far red light



CANNA[®]

What's true and what's not



THE MAGIC of mint



NEW:
PESTS & DISEASES

THIS ISSUE:
APHIDS...

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The solution for growth and bloom

And more:

Light Systems

Grower's talk

Cartoon

Pests and Diseases (NEW!)

Questions & Answers

Grower's Tip

Factographic

Puzzle & Win



FORGROWERS

HOT Talk:

Light... Without it, there would be nothing! It literally affects everything. There is no way around it and it is hard not to take for granted. And yet, it is both obvious and mysterious. The sun comes up everyday, we switch on the light everyday but then again, what exactly is light? Is it a ray, a stream of particles, a wave maybe? Empedocles, Plato, Newton and Einstein, many have wondered and tried to unravel this mysterious resource. But like with any form of science, just when you think it is figured out it defies all efforts and seems to change its nature.

Luckily we have come a long way in understanding it. Without this understanding we would not be able to grow the way we like to grow. Still, since light is such an important factor in our industry we thought it was worth it to make it a theme for CANNAtalk. So we did.

In this issue you'll find two articles written by CANNA Research. One telling you about the different light systems available in the market nowadays. The other one explains the effects of Red and Far Red light on the flowering response in plants. Two very interesting articles that we hope will answer some of your questions. If not, please contact us, we are always willing to help you out.

Then something different.....

Our industry is one that is booming worldwide. With the rise of the industry, competition rises as well. This is a good thing for both companies and growers. Unfortunately there's also a down side. In this case a lot of confusion, rumors and even lies! As a company that was created from a view to help out growers, we hate to see that a lot of businesses evolve just to take a piece of that booming industries' pie without scruples. We think that's an unfair way to conduct business and untruthful towards growers. To alleviate some rumors and to let people decide for themselves what to believe we want to give you a little look inside our company; it's foundation, development, production, research and future. Read about it on page 20.

As always, for any response, questions or whatever you'd like to share please email us at editor@cannatalk.com

Enjoy reading,
Jeroen



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THE EFFECT OF

RED

AND

FAR

RED

LIGHT

ON FLOWERING

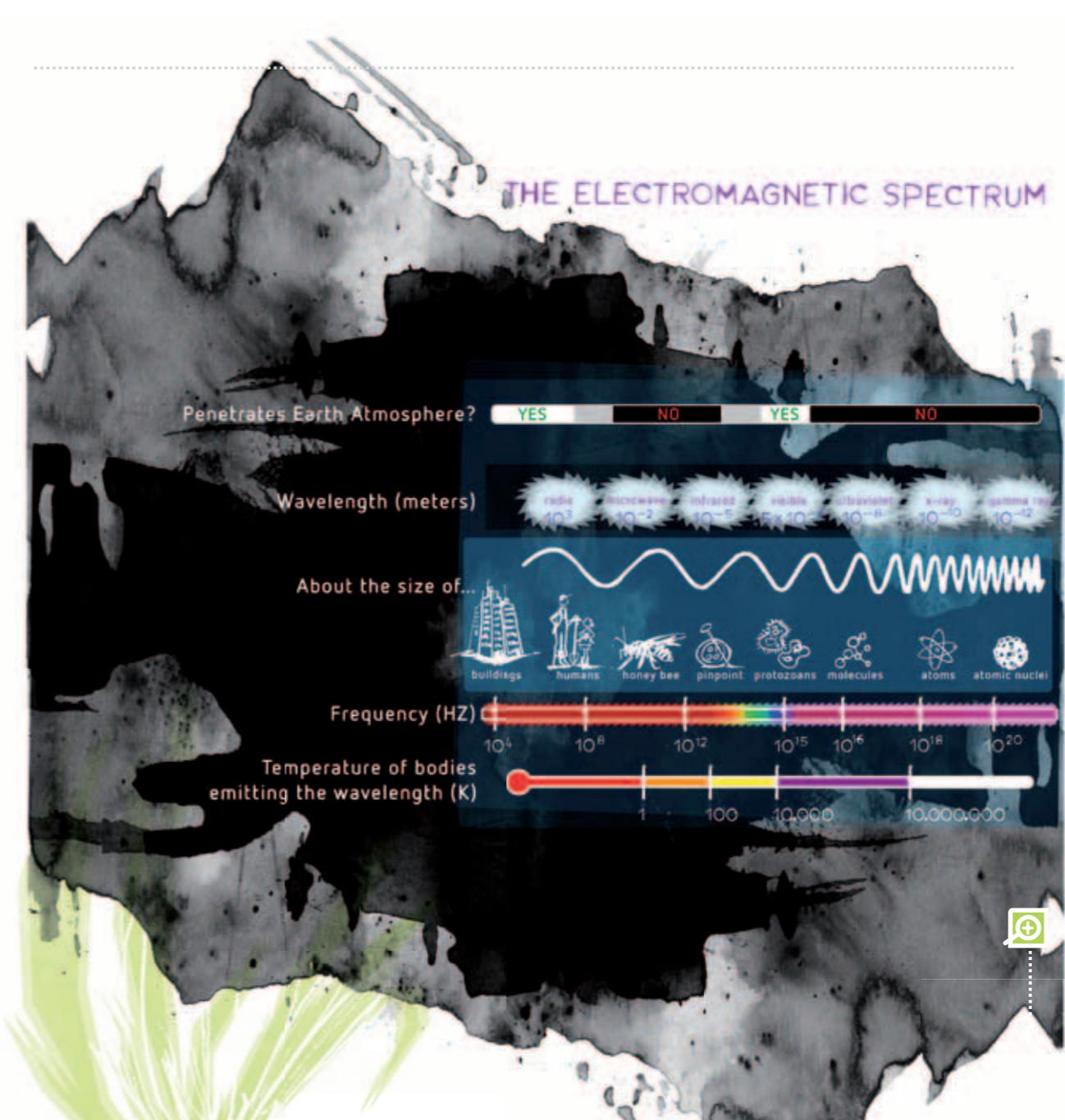


Figure 1: The wavelength of electromagnetic radiation can be as small as an atomic nuclei and as big as a skyscraper. Visible light is also a part of electromagnetic radiation.

WHAT EXACTLY CAUSES A PLANT TO FLOWER? WE DO NOT YET HAVE A COMPLETE ANSWER TO THAT QUESTION, BUT WE DO KNOW A GREAT DEAL ABOUT THE MECHANISMS THAT TRIGGER THE RESPONSE. THERE IS NO SINGLE PHENOMENON THAT CAUSES FLOWERING, NOR IS THERE ONE MAGICAL HORMONE THAT IS RESPONSIBLE FOR IT. PLANTS FLOWER IN RESPONSE TO SEVERAL TRIGGERS THAT LEAD TO A FAIRLY COMPLEX CHAIN OF PHYSIOLOGICAL AND GENETIC RESPONSES, WHICH ULTIMATELY CAUSE A CHANGE IN THE MORPHOLOGICAL CHARACTERISTICS OF THE FLOWERING APICAL SHOOT. CHIEF AMONG THESE TRIGGERS ARE AN EFFECT OF THE LIGHT KNOWN AS PHOTOPERIODISM.

By Geary Coogler, BSc Horticulture.

Photoperiodism means the plant's response to certain light signals, including both the duration and the quality of the light it receives. Plants do not sense light in the same manner as people or animals sense light. In plants, the part of the electromagnetic spectrum which we perceive as light acts by providing energy for specific photo-chemical reactions in both control and energy production pathways. Animals also use light energy to 'see' the world around them. Light is a duality, existing both as a discrete particle (a photon) and as a wave. The higher the frequency (shorter wavelength), the higher the energy state of the quantum bundle known as a photon (see figure 1). The photo-chemical systems within plants are designed to capture specific frequencies of light and harness its energy to perform chemical reactions.

Plants capture light energy for two basic reasons: to make carbohydrates, and to control some of the thousands of processes that occur in plant cells. Here, we are only interested in process control, but the wavelengths used to make carbohydrates are roughly similar. There are basically four colors of the spectrum that plants work with: UV (ultraviolet) from 340 – 400 nanometer, blue from 400 – 500 nm, red from 600 – 700 nm, and far red (the start of infra-red) from 700 – 800 nm. These figures are not absolute because actually the colors overlap and a plant will use some of the energy from 500 – 600 nm too, although not much. The plant makes use of different pigments to capture different wavelengths of energy. Broadly speaking, the four bands of electromagnetic energy control the activities of the



plant through three collection points, or light absorbing pigments; cryptochromes (blue and UV), phytochromes (red and far red), and phototropins (blue and UV). The light collection points act like switches that turn on and off certain processes in the plant, and regulate others. While a human will only perceive the colors (wavelengths or frequency) reflected back to them and experience only a brightening or a dimming of the light level, plants are also sensitive to the light shift among frequencies that show as intensity to us. Plants grown in the shadow of others receive much more red and far red light than they do blue light. They are sensitive to the shift from red to blue light that occurs naturally at sunrise, and the opposite shift that occurs at sunset. They are also sensitive to changes in the time when these daily events occur. The different pigments act as switches that are triggered by the energy of a specific wavelength as a ratio of one frequency to another. Even the absence of light affects a plant's response through these control centres. All these controls affect the process known as flowering.

Light controls the natural rhythms of the plant (as it controls – for example – the sleep patterns of animals too!). These natural rhythms, or Circadian Rhythms, are inherent in all life forms. Life has a series of events it goes through during the course of each day. There are periods of activity and periods of rest. There are times when fuel is consumed and other times when certain activities or tasks are performed. All of these activities become programmed into a more-or-less 24 hour period. It is inefficient to produce the chemicals used for capturing photons when it is dark (although some are). Just like a factory, components need to arrive when needed, stock taking must be done and a minimum level should be kept available, and assembly lines should roll when all the right parts are there. Light determines these rhythms, and not only through its presence but its quality as well.

A plant senses both the quality and the quantity of the light it receives. Based on environmental factors such as air quality or the time of year, the plant will sense

RED AND FAR RED LIGHT

a different ratio of colors. This difference is basically measured by the pigments which, when coupled with other triggers and processes, control what the plant 'does', and when. It sets the biological clock in the plant so that all the plant's processes continue to run in harmony. Cryptochromes sense the direction of the light and its quantity. Responses governed by cryptochromes include stomatal function, gene transcription and activation, the inhibition of stem elongation, pigment synthesis, and the tracking of the sun by the leaves.

Phototropins, the other blue light receptors, are responsible for phototropism or plant movement, and the movement of the chloroplasts inside the cell in response to the quantity of light as a damage avoidance system. There is also some evidence that they activate the guard cells at the opening of the stomates. Phytochrome is a complex of pigments that occurs in two basic kinds: one that responds to red light (Pr), and another that responds to far red light (Pfr), depending on the light frequencies that they absorb the most (even

though the other frequency will also activate it and blue light too). The two pigments generally convert back and forth, with Pr converting to Pfr with red light and vice versa (although some forms of Pr/Pfr lose the ability to reconvert depending on the amount of light, the intensity, or the quality of the light received). The active form, which triggers responses such as flowering, is Pfr. Red light exerts the biggest influence on photomorphogenesis (the effect of light on plant development) and far red light can sometimes reverse Pfr responses. Phytochrome controls many functions such as gene expression and repression, gene transcription, the elongation of seedlings and stems, germination, photoperiodism (the flowering response), shade avoidance and adjustment to differing light levels, and chlorophyll synthesis.

One example of a red light response is the change in the light interval from long days to short days, which will trigger flowering in short-day plants. This is because the plant senses the change through the ratio difference between red light and far red (or no light), and begins to

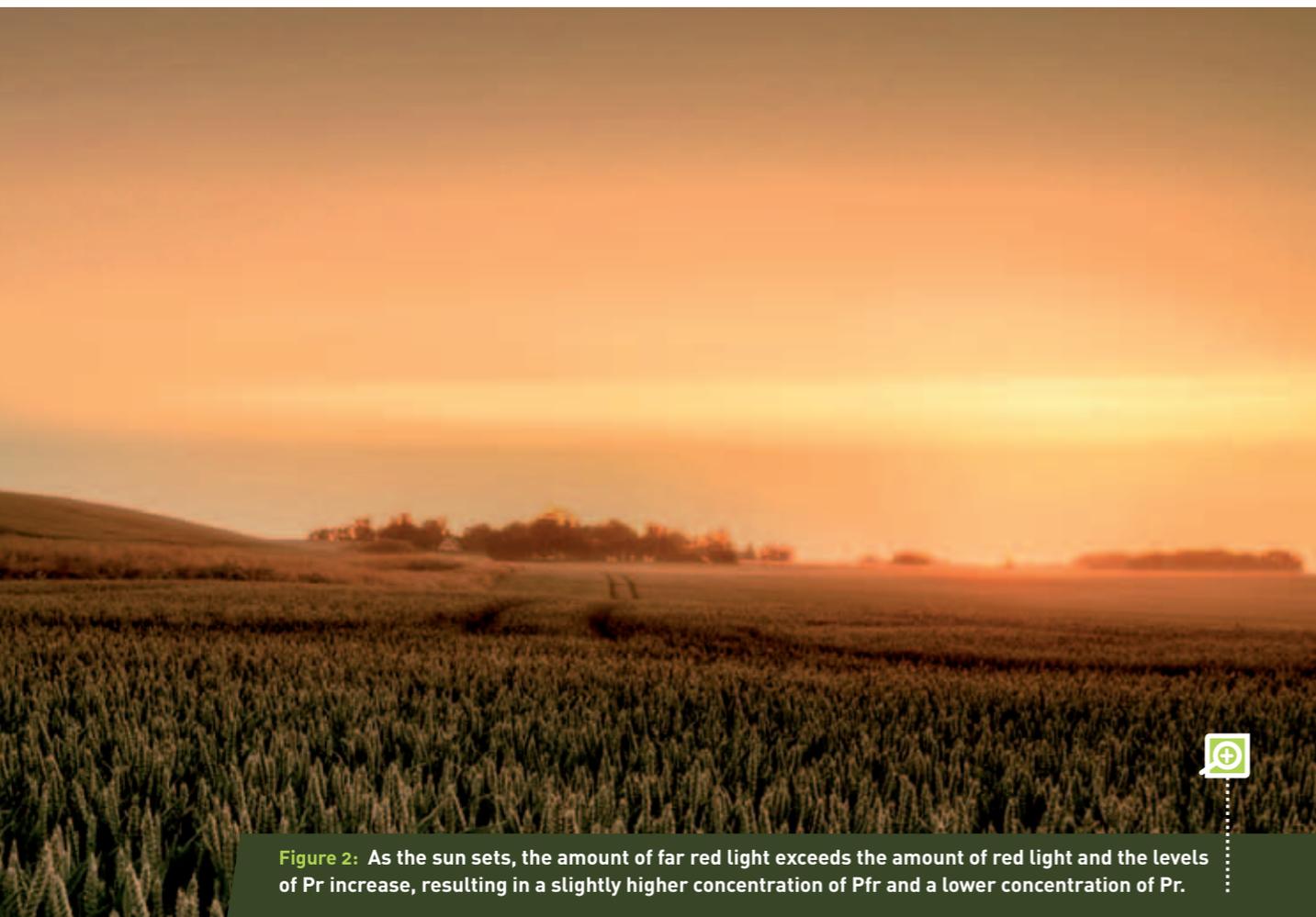


Figure 2: As the sun sets, the amount of far red light exceeds the amount of red light and the levels of Pr increase, resulting in a slightly higher concentration of Pfr and a lower concentration of Pr.



Figure 3: The next morning, there is total light again and the ratio of Pr to Pfr returns to equilibrium.



change its physiology from a state of vegetative growth to floral growth. While the plant is receiving light, the ratio of Pr to Pfr (Pr: Pfr) is approximately in equilibrium (in fact, Pfr is slightly higher). Pr is converted to Pfr by red light and Pfr is converted back to Pr by far red light. As the sun sets, the amount of far red light exceeds the amount of red light and the levels of Pr increase, resulting in a slightly higher concentration of Pfr and a lower concentration of Pr. Pr is produced naturally by the plant during the darkness and accumulates. Pfr also slowly breaks down to Pr (its half-life is approximately 2.5 hours). The next morning, there is total light again and the ratio of Pr to Pfr returns to equilibrium. In this case, it could be said that Pfr is like the grains of sand in an hour glass. It is currently thought that when Pfr concentrations are low and Pr is high, short-day plants flower and long-day plants do not. When Pfr concentrations are higher and Pr concentrations are lower, long-day plants flower and short-day plants do not.

If we take two plants, one which is set to flower at a day length of 10 hours light/14 hours darkness (a short-day

plant) and the other set to flower at 14 hours light/10 hours darkness (a long-day plant), the period that determines flowering is actually the night. This process is illustrated in figure 3. In effect, the short-day plant needs 14 hours of darkness to accumulate Pr and convert enough Pfr to Pr for the level of Pfr to be suppressed for long enough overnight for a morphological change to begin. This change becomes irreversible after a certain number of days. In a long-day plant, this process is basically the same but reversed. They respond to the presence of higher levels of Pfr.

The length of time for which Pfr is the predominant phytochrome is what causes the plant to begin flowering. However, if the Circadian Rhythms are not right, and initially they will not be, the components needed to effect change may not be present at the beginning and the rhythms will have to 'catch up' before the change begins. Pfr ceases the repression of Florigen, the flowering signal, or it stimulates expression, and the signal makes the plant flower. Basically, the levels of Pfr tell the plant how long the night is.

RED AND FAR RED LIGHT

Florigen, once described as a theoretical hormone, is now generally described as messenger RNA known as FT mRNA. In very simple terms, this is a protein molecule that is produced on a portion of the DNA of a plant in an area known as the FLOWERING LOCUS (T). This protein is like a key which searches out a specific lock that it will fit into. When the lock is turned, this initiates other processes. When combined with another gene known as CONSTANS (CO), it is now generally accepted that this begins the change from vegetative to flowering states. So the change to flowering by a plant involves external signals which affect, control and run the processes of the plant and trigger gene expression. All of this is triggered by the changes in the light which are picked up by the plant.

There are basically five types of flower response in plants. There are short-day plants (SDP), which simply require a shift to short days and long nights in order to flower. There are long-day plants (LDP), which require the opposite. Then there are long-day short-day plants (LSDP) and short-day long-day plants that require a specific amount of time as a long or short-day plant followed by a short day or long day to flower. Finally, there are day-neutral plants (DNP), which require the same light functions but flower on triggers other than day length. In all cases, it is not only the type or quality of the light received which triggers flowering, it is also the duration of the light (in all cases but the DNPs). To be precise, it is the duration of the absence of light at night which triggers flowering, but based on processes and metabolites (Pfr, etc.) that the light has driven. It is important to understand that there are thought to be many other processes which play a role along with those described here, including the interaction of other genes and hormones such as GA (gibberellic acid).

Light is critical for all life, but especially plant life, where it not only produces the substrates for growth and metabolism, but it also establishes the rhythms and cycles of daily routines. Light controls critical aspects of survival and propagation; it sets the tempo for life in all organisms. Just as importantly, not all light is equal as far as a plant is concerned. The correct ratios of light (blue to red, red to far red, and so forth) have to be available for the plant to function correctly. Just like everything else, a plant can get too much of a good thing. In the end, however, while light is absolutely critical to plants, it is only a part of the overall equation of life. •



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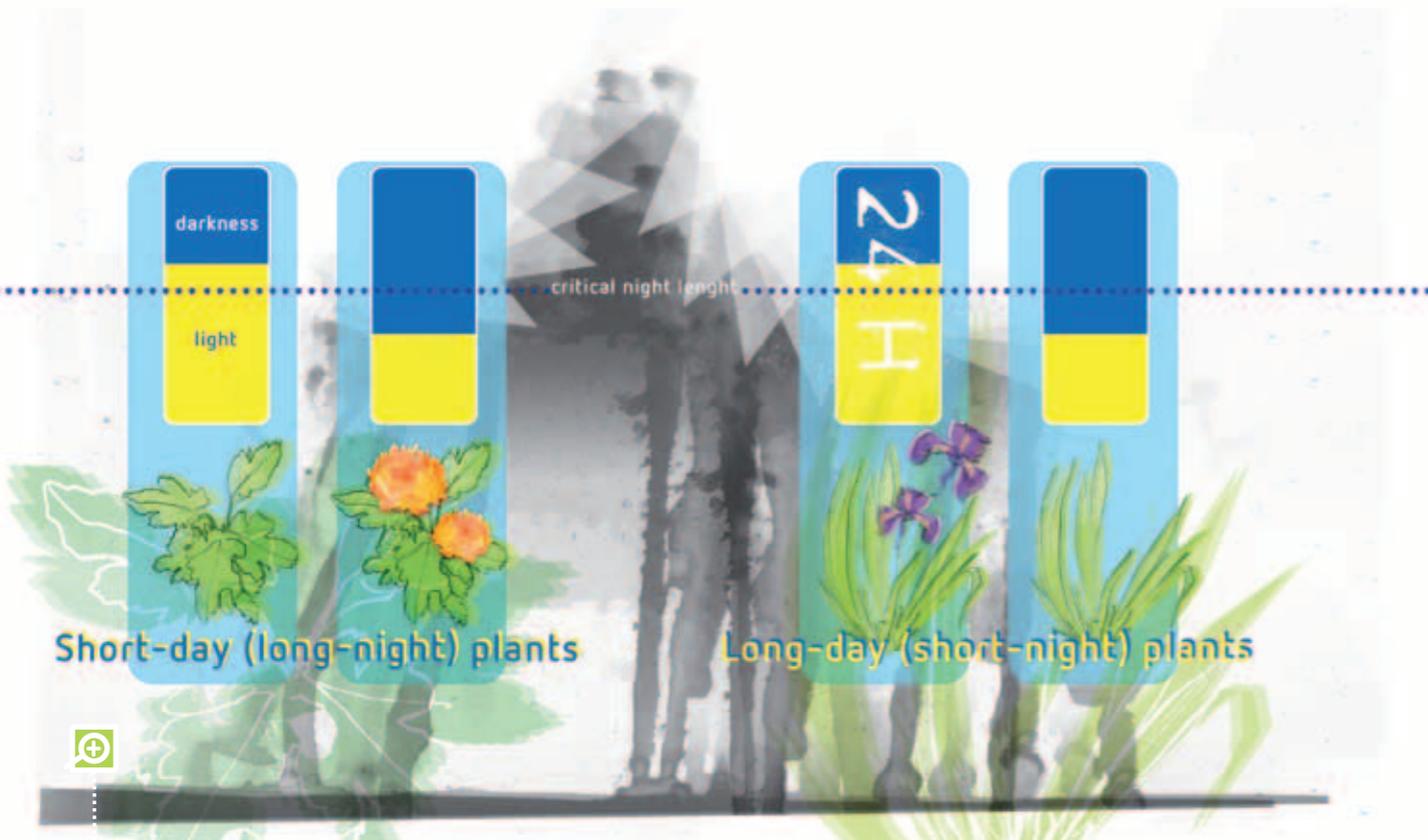


Figure 4: Night length affects blooming in many plants. a. Short-day (long-night) plants such as the chrysanthemum bloom when night lasts longer than a critical length. If that critical length is not long enough, the plant fails to bloom. b. In contrast, long-day (short-night) plants, such as the iris, bloom when nights are shorter than a critical length.

Questions

& Answers

There are at least as many different questions about growing as there are growers in the world. Through the website www.canna-hydroponics.com, many CANNAtalk readers and other growers send us questions, asking for our help in resolving cultivation-related problems. As always, our Research & Development Department is more than willing to answer them!

Question

Hi, I use a deep water culture bubble bucket, following the dynamic grow schedule that you have on the site. Right now I'm in the grow phase using CANNA Substra Vega A&B, CANNAZYM and RHIZOTONIC (normal feeding). I'm getting a lot of algae in the tank, algae that binds to the roots so I have to clean it every 48 hours. The bucket is as good as light-proof and the water temperature is around 68-70°F. I was wondering if I can use hydrogen peroxide (H2O2) as a combined pH down/anti-algae solution? I have used H2O2 as an anti-algae solution before, just not with CANNA's nutrients. And since at least the RHIZOTONIC is said to be algae based, I wonder if the H2O2 will have a more negative than positive overall effect?

Answer

Algae only grows when light can enter the algae. Make sure that the tank pipelines, and the substrate surface are in the dark. Most of the time you solve the problem by covering the pot with black/white plastic around the plant. (small tent) Using H2O2 can become dangerous. It kills organic matter in general. So the algae in the first place, but it can also dissolve (kill) the root. Advice: max. 300 ppm during visible algae and 100 ppm if your system is vulnerable for algae. pH-control by H2O2 is DANGEROUS, but depends on the water. A little is possible but never more than the advised doses in ppm.



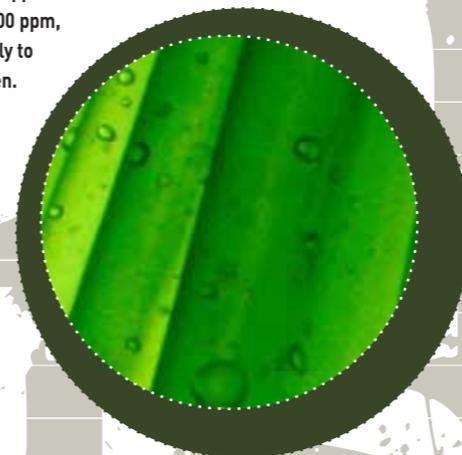
algaecide

Question

Hi, how can you control your EC levels? also how can I find out what level my EC should be at different stages of plant growth?

Answer

You can control your EC with an EC meter. EC control in the root zone has to do with the substrate. You can check CANNA AQUA and CANNA SUBSTRA immediately and control it. For CANNA TERRA and CANNA COCO, you have to take a sample out of the substrate. In general the EC level in the root zone should not increase if you stabilized the EC you add to the plant. When the EC of the root zone start to increase, you have to compensate /lower the EC you give to the plants. If you want to know how much we advice to add to the plant I suggest, you visit our web page and fill out the grow schedule. You will get a personalized grow schedule! Please do not hesitate to contact us again for any questions!



I have 12 plants in a 3x3 tray, which have just passed

We have a few questions th

The answer to your first question

Question

I have 12 plants in a 3x3 tray, just getting through seedling stage. They have just been transplanted to the coco medium, in cloth pots (for their automatic root pruning and nutrient saturation qualities.) I am currently flooding the table once per day, approximately one hour after going into the 6 hour sleep cycle. I have added the appropriate amounts of CANNA COCO A&B, RHIZOTONIC, and CANNAZYM to the reservoir. I also mixed one gallon of RHIZOTONIC for distribution throughout the topsoil, in an attempt to help the seedlings with a boost. The 20-gallon flood-and-drain system carries the rest of the nutrients to the plants once daily. Two questions: 1. Am I feeding at the appropriate frequency? (medium is remaining moist between feedings) 2. If I dump used nutrients in the yard, will touched vegetation be harmed?

Answer

To begin, for sanitary reasons, it is best to water when the lights are on. Also, if the medium is still damp or wet, it might be too early. As long as there is moisture, there are nutrients. We usually use a 50% dry rule so when the containers have lost, on average, 50% of the water they hold, then water. This is best shown by using a scale until you are used to the look and feel. Next, typically growers use it to feed the rest of their gardens outside. Using an ebb and flood system on coco will result in tank water with a rather high ppm concentration because of what is given off by the coco. If it is too long between tank changes then it may cause a burning issue on sensitive plants. Check the ppm then dilute if above 1200 ppm, then apply to the garden.

Question

We have a few questions that would really help us. 1) On your label for the CANNA COCO A&B it says to use tap water. We have a sediment and de-chlorine filter on our tap water output, is this okay to use with your nutrients? 2) We are using the ebb & flow table system. We want to use your coco fibre, but cannot figure out the correct container to use for this system due to the fibre being so coarse. What do you guys suggest for a container when using the table ebb and flow system? 3) When using the table ebb and flow system with coco fibre, is it better to use the CANNA COCO A&B or the COGr Flores A&B?

Answer

The answer to your first question is yes you can use your water with the filters. You can even use reverse osmosis (RO) water but we do request you use a medium to slightly hard water source so RO would require the addition of tap water to bring the EC to above 0.15 or about 120 ppm. The second question is not so easy. The principles of capillary action, gravity, and time all play a role in determining this. Water will move upward against gravity and quick enough to avoid problems as long as the pores are numerous enough, the pores are small enough, and the distance travelled is short enough. I tell you all this because it will help you understand my answer. In coco, we do not recommend any system that waters from the bottom. I know folks do it but we do not recommend it. Coco really needs good drainage to remove the excess salts it releases while decaying. Also, these and nutrient salts are forced to the top layer of medium forming a salt zone that roots will avoid. This is demonstrated by hanging a string over and with the tip of the string in a cup of salt water. Soon you will see salt formations on the string at the top as the water migrates upward. We recommend top down watering of the product and I recommend using spray stakes not drippers, especially for larger containers. Now, if you are going to use a flood and drain (ebb and flow), then you have to make sure that the solution will make it to the top of the medium profile within a 15 minute window. Any longer and the risk that the roots will drown increases above acceptable levels. Some growers will even trigger the system when the medium is still above 50% dry to make it faster, but they usually end up fighting an over-watering problem because of this. In reality, any container that will allow the water in will work. The secret is in how high up the container the flood stage will achieve. Typical systems allow for about 3-4 inches of water to stand on the table, about the table tray height. You really need to be within about 2-4 inches of the top of the medium to insure the water will absorb correctly within the 15 minute window. Medium with nice porosity (small enough to work at peak capacity) can be pushed slightly higher. Allowing a faster pump will cut the fill time on the table and allow for taller as well. The solution will rapidly fill the container to the water level point but then capillary action has to work from there. The 15 minute interval has to include the amount of time it takes to drain the pots and the table. Now, the buffered coco from CANNA has good small porosity and wicks well but not as fast as rock-wool. It is faster than a 1:1 perlite peat mix. COGr board has more air space and will take about 15% more time to work. So, I would be really pressed to tell you what size containers to use, something that will keep the medium in place with sufficient holes to allow the water in. It will not work significantly better with a net style container, because the medium will wet about as fast as the water rises in the water zone, the question comes at maximum depth when capillary movement takes over. Typically these containers used in this fashion are shorter pots, limited in height not width. As to the appropriate nutrient, using fibrous COGr board will require that you use the COGr nutrient (COGr Vega and Flores A and B) and the Buffer Solution applied as a soak before planting.



GROW IT YOURSELF



THE MAGIC OF MINT



Figure 5: The 8th, 13th and 17th day of cultivating Mentha Piperita.

THERE IS NO QUESTION ABOUT IT. WITHOUT MINT, THERE WOULD BE A LOT OF PEOPLE WALKING AROUND WITH HALITOSIS (THAT'S BAD BREATH TO YOU AND ME). THE FRESH SMELL AND TASTE OF MENTHOL, THE OIL THAT IS DERIVED FROM MINT, HAS MADE A LOT OF KISSING MORE ENJOYABLE. NOT BAD FOR A LOWLY PLANT THAT, IN GREEK MYTHOLOGY, STARTED OUT AS A NYMPH. ARE YOU READY TO GET FRESH?

Text: Marco Barneveld , www.bqurious.nl

Refreshing and heart-warming

When you hear the words "fresh mint" on a warm summer's day, you'll soon be picturing a long sprig of green mint submerged in hot tumblers or icy silver cups. Sweetened with sugar or honey, or just au naturel – whatever works best for you. Mint is the Moroccan symbol of hospitality, and in the hot streets of the medina, mint refreshes the old men sitting in the street, playing chess or just watching the world go by.

In colder northern climes, mint has other uses too. Mint is used dried or frozen to flavor and garnish roast lamb or vegetables, jelly sauces and creamy desserts. It's a versatile friend for chefs all over the world. Families will sit together and enjoy each other's company. Many cooks like to add chopped mint leaves to scrambled eggs or omelets, for a change of pace, or to egg substitutes to enhance the flavor. Add the mint at the end of cooking of scrambled eggs or omelets, because too much heat will

turn the mint bitter. Fresh mint leaves add a refreshing twist to salads.

To reduce the effects of tannin and caffeine in your favorite tea, use fresh sprigs of mint, spearmint or peppermint in your teapot with your favorite tea. Tear off a few well-sized leaves, rinse and add them to your teapot. Steep for 2-3 minutes or longer for a more potent flavor.

Healthy little bugger

Whichever way you enjoy mint, it is excellent for your health. In fact, the reason that most of our ancestors grew this pungent herb as long ago as 1500 BC was its many health benefits. Even today, naturalists still use peppermint to treat gallstones, irritable bowel syndrome and the common cold. It was also originally used as a medicinal herb to treat stomach ache and chest pains. To cure stomach aches, the Romans put dried mint leaves in boiling water, and then, when it cooled, they drank it. We still do the same today, of course! Those Romans

knew a thing or two. Nowadays, this type of tea is called monstranzo. In the middle ages, powdered mint leaves were used to whiten teeth. It seems that people were vain, even in those dark times. Anyway, mint tea is a strong diuretic and also aids digestion.

All mint contains menthol, the volatile oil that gives mint its characteristic cooling, cleansing sensation. Menthol is an ingredient in many cosmetics and some perfumes too. It is also added to toothpaste. Menthol oil and mint essential oil are also widely used in medicine as a component of many drugs, and are very popular in aromatherapy.

The herb mint belongs to a large family including over 30 species, the most common being peppermint and spearmint. Native to the Mediterranean and Western Asia, mints often interbreed, making it difficult even for an expert to distinguish all the varieties.

Mythical mint

The Greeks believed that mint could clear the voice and





THE MAGIC OF MINT

RECIPE MINT COOLER

TRY THIS ZINGY MINT COOLER

Here is what you need:

INGREDIENTS

- Half a cup lightly packed fresh mint leaves
- 2 cups lime cordial
- 2 cups club soda
- 4 slices lime

And here is what to do. Put aside four mint leaves for garnish. Place the remaining mint leaves and lime cordial into the blender, and process until mint is finely chopped. Stir in the club soda. Serve in tall glasses over ice. Garnish with fresh mint leaves and lime slices. Truly magic. Again and again. Now get fresh, you hottie!



cure hiccups. In fact, mint is part of Greek mythology and according to legend "Menthe" was originally a nymph. She made the huge mistake of becoming Pluto's lover. His angry wife, Persephone, was crazy with jealousy and in her rage turned Menthe into a lowly plant, to be stepped upon by everyone. Pluto was unable to undo the spell, but he was able to soften it by giving Menthe a sweet scent so his poor ex-lover would perfume the air when her leaves were stepped on. On warm summer nights the beguiling aroma of the crushed leaves are especially invigorating.

Grow it yourself

Surely we have persuaded you by now... Are you ready to start growing mint? It's one of the easier plants to cultivate. Mint is a perennial and its seeds can be sown in pots or in the ground. Once this tenacious herb takes hold in your garden, it is very easy to propagate the plants by taking cuttings and transplanting them once the roots are well established.

Mint needs humid soil and only moderate sunshine. It will grow in and around all garden plants, not unlike a weed. It is tenacious and often seems determined to spread itself around the garden. The trick is to continuously cut it back and restrict growth, otherwise the herb will spread like wild fire through your garden and take over. The stolons of mint are some of the most aggressive in the entire plant world. If you plant it in the ground, the first year you will wonder what all the fuss is about. The second year you will find a few stray sprouts and by the third year it will be knocking on your bedroom window! Mint will grow 20 feet under weed block and come out the other side and with no water in the middle of summer.

You can also grow mint in pots with other herbs. Legend has it that this is a good herb for keeping ants away from doors and combating mice and fleas. Keep mint leaves near food, beds and wardrobes. Use it to freshen the house like an air freshener. It can bring a fresh herbal fragrance into every room.

Our favourite minty friends

There are about sixteen varieties of mint that you can cook with. These are our three favorites. The first is peppermint, which has a sharp and penetrating, but pleasant, minty aroma. It grows up to one to two feet high, but can reach three feet when in bloom. The lance-shaped leaves are deeply notched when mature and its flowers are usually purple. Pineapple mint gets its name from the slight hint of pineapple in its fragrance, although the aroma isn't always detectable. This mint is good for garnishes because its thick leaves are slow to wilt. It has white spots on its leaves. Last but by no means least, there is spearmint. Spearmint has a fruity aroma and flavor and goes well in many foods including salads, sauces, teas and dips. It has bright green leaves and purple flowers.

But enough talk.

Let's get chopping!



A word from
A GROWER

Growers TALK

Carl, from Detroit.

The first years after I started growing, I never encountered any real problems. Unlike many other beginners, I did quite well. What were they moaning about on all those internet forums? Growing was easy! Either that, or I was just really talented.

I was too stuck-up to realize that I'd never done anything that required anything more than very basic growing skills. So when I switched to a more advanced method of growing, my smug smile was nowhere to be seen any more...!

Five years ago I decided to start growing plants in my own house. I began with small, exotic fruits in potting mix. I used a watering can to administer water and nutrients. With a minimum of effort, I got good but small yields every time. It was almost too easy.

Last year, I decided I needed a bigger challenge. I wanted to use a more complicated growing system that could produce more and better crops. I purchased an ebb and flow system. My uncle is a florist and wanted me to grow some beautiful chrysanthemums. I couldn't let him down so I figured I should use the best products this time, and I'd heard that CANNA nutrients were the best.

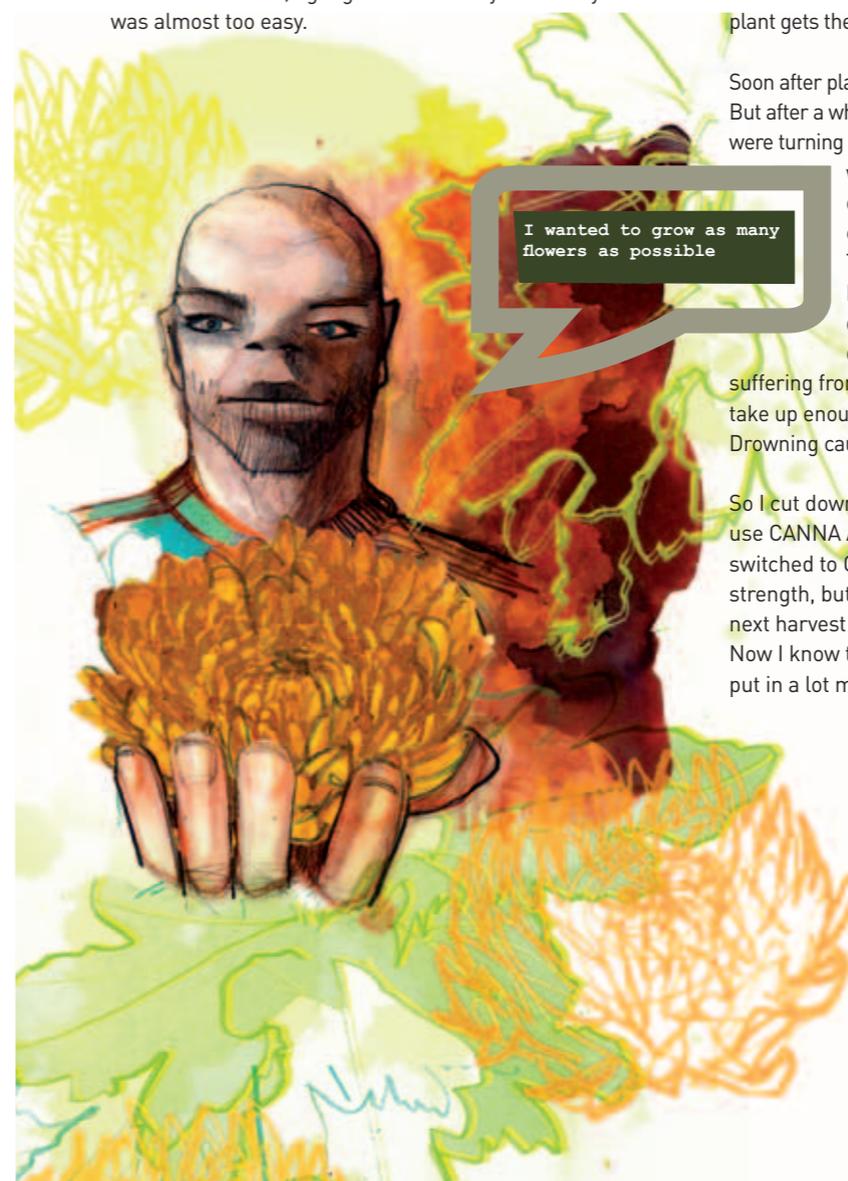
I used an ebb and flow system because I wanted to grow as many flowers as possible, and this way I could make use of every single square inch I had. I used CANNA AQUA nutrients, because this is a recirculating system. With an ebb and flow system, you don't need to walk between pots any more. You can administer all the water and nutrients to all of your plants from one point. Each plant gets the same amount of water and all in all it's less work.

Soon after planting the seedlings, my flowers started to grow. But after a while I saw that the leaves at the bottom of my plants were turning lighter green, and then - horrifyingly - yellow. They were also too small. After a few weeks, I went to the owner of my local grow shop. Were the nutrients causing the problem?

The nutrients weren't the problem, he said. From what I told him, he thought I was probably drowning my plants. There wasn't enough root development. This meant that the plants were suffering from a nitrogen shortage. The roots just couldn't take up enough nutrients, because of a lack of oxygen, he said. Drowning causes a lack of oxygen in humans as well as plants.

So I cut down drastically on the water supply, continuing to use CANNA Aqua Vega. When the flowering period started, I switched to CANNA Aqua Flores. My flowers regained their strength, but they never became real show models. But the next harvest of chrysanthemums was big, bold and colorful. Now I know that to get more out of your plants, you have to put in a lot more effort. •

I wanted to grow as many flowers as possible





The MOON

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

- The same side of the moon always faces us on earth, because it rotates exactly 360 degrees during its orbit around the earth.
- The 'dark side of the moon' is not always dark; it gets just as much sunlight as the side we see on earth.
- The gravity of the moon is the major cause of tides in the sea here on earth. The rotation of the earth and the gravity of the sun to a lesser extent also contribute to the tides.
- Since the dawn of man, people have believed that the moon has a profound influence on crops. There is little scientific evidence that this is really so. However, some scientists say that short-day plants may flower more abundantly when exposed to moonlight at night, rather than complete darkness.
- Nowadays, there are still many growers who believe the best time for planting is on the waxing moon and the best time to harvest is on the waning moon.



Pests & DISEASES

CANNAtalk is proud to present a brand new recurring section: Pests and Diseases. Plant pests and diseases are the fear of many growers as they can ruin crops and kill plants. In our first instalment we discuss aphids. Aphids are among the most destructive pests on cultivated plants in temperate regions. They can cause decreased growth rates, mottled leaves, yellowing, stunted growth, curled leaves, browning, wilting, low yields and death in plants. Please note: This isn't the whole article. Because we really wanted to expand on the subject, we decided to put the rest of the article on www.canna-hydroponics.com.
By Iñaki García

APHIDS DAMAGES AND CONTROL

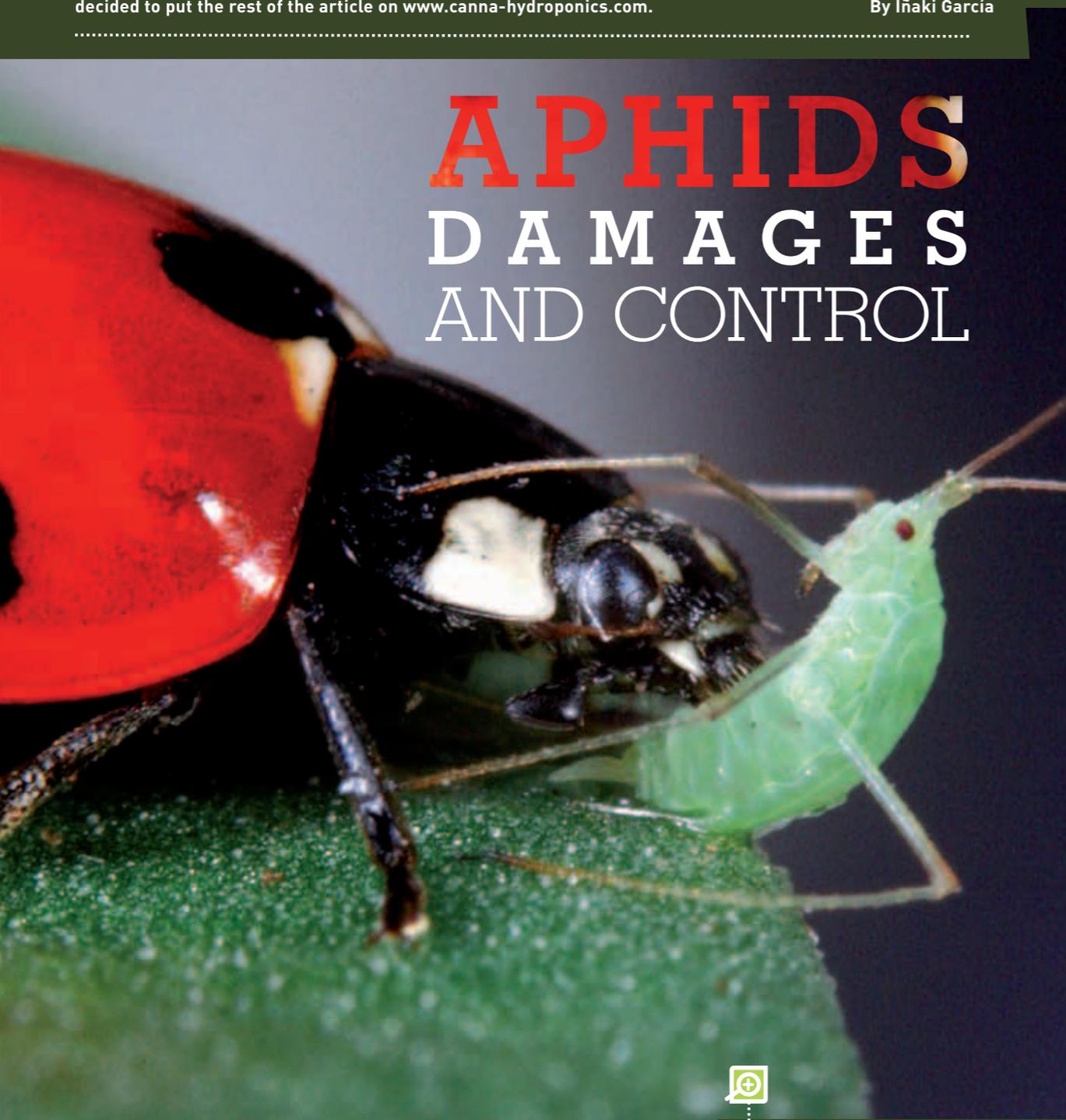


Figure 6: Ladybird feeding on an aphid

So, for example, *Hyadaphis coriandri* prefers coriander, *Brevicoryne brassicae* prefers crucifers such as cauliflower, the cotton aphid (*Aphis gossypii*), the cereal aphid (*Schizaphis graminum*), black peach aphid (*Brachycaudus persicae*), and so on. All aphids are characterized by a stylus (a kind of syringe needle) that is used to pierce and suck the sap from the plant, and a couple of tubes in the back called cornicles or siphunculi through which the animals excrete a kind of honeydew called cornicle wax. Aphids usually feed on the plant's phloem sap which is rich in sugars, minerals and other elements. The phloem is responsible for distributing this kind of sap throughout the plant. But the aphids also draw fluid from xylem, where raw sap runs directly from the roots. This provides the aphids with water, allowing them to stay hydrated during hot or dry periods.

Life cycle

A generation of aphids survives the winter as eggs, which allows them to withstand extreme environmental conditions of temperature and moisture. In spring the eggs on the plant (primary host) hatch, leading to the first generation of aphids. All the aphids born from the winter eggs are females. Several more generations of female aphids are born during the spring and summer. A female can live for 25 days, during which time she can produce up to 80 new aphids. Spring and summer reproduction occurs asexually – without males. This is known as parthenogenesis. In these cases, the resulting aphids are basically clones of the mother. In addition, the reproduction at this time of year is viviparous – i.e. the young are born live rather than as eggs (oviparous reproduction). When the fall approaches, there is a generation that grow into both male and female individuals. Females fertilized by the males lay winter eggs on the plant where they are, closing the cycle.

This entire life cycle, including the viviparous phase followed by a final stage of oviparous reproduction, is known as holocyclic. However, it can also be the case that some species of aphids are always viviparous, and have an anholocyclic life cycle. In these cases, the resulting generations are not clones but are genetically different from the mother.

Often, the factor that makes an aphid species anholocyclic or holocyclic is the local climate. In milder regions, a species that is usually holocyclic can be anholocyclic, while in colder climates they are holocyclic (remember that the eggs can resist cold temperatures and that some aphids cannot develop at temperatures below 5°C). Anholocyclic aphid species overwinter as nymphs or as wingless adults. In both cases, the aphids can be winged or wingless (apterous). Usually the first generation to emerge from the winter egg are apterous but after several generations there can be a lack of space on the host plant, triggering the birth of a generation of winged aphids which can migrate to other hosts. The dispersal of the aphids will also depend on the type of host plant. Some species of aphid develop only on plants of a particular species. These types of aphids are called monoecious. Monoecious aphids spend their entire life in trees and perennials.

The most common species that attack crops are heteroecious aphids that feed on different plant species. Holocyclic heteroecious aphids start their cycle when the winter eggs hatch on the primary host. The primary hosts are usually annual weeds, shrubs or trees. A couple of parthenocarpic generations then give rise to a generation of winged females that migrate to the secondary host, which is usually a cultivated plant. In this new environment the aphids reproduce parthenocarpically for several generations of females until the arrival of autumn, when there is a generation of winged males and females which return to the initial host plant and lay fertilized winter eggs, closing the cycle again.

Winged aphids are not able to fly in a straight line and even light winds hinder their movement. They know where to land through sensory stimuli such as visual (they are attracted by yellow), mechanical, olfactory and gustatory stimuli.

The aphid first introduces its stylus into the surface of the plant and probes to discover if the sap is appropriate as food. In the case of a proper species, the stylus is inserted more deeply to reach the phloem. If the sap is not right, the aphid flies to another plant.

Read the rest about aphids and how to combat them on www.canna-hydroponics.com.



Figure 7: 2 aphids feeding on a plant. This photograph was made by Luc Viatour / www.lucnix.be

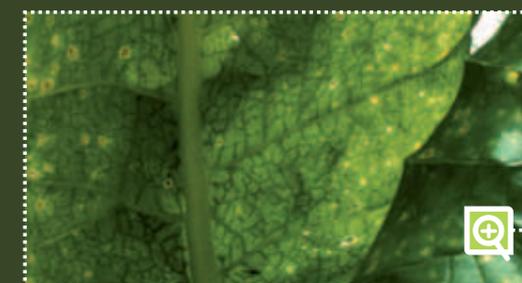


Figure 8: Potato plant damaged by the Potato Virus Y which is transmittable by aphids. The Potato Virus Y (PVY) is one of the best known viruses affecting Solanaceae (tomato, potato, sweet pepper etc.)



What's

HAPPENING



CANNA[®] WHAT'S TRUE AND WHAT'S NOT?



The hydroponic market is one that is booming. The plain logic: new products and new companies rise or enter the market every day it seems. This gives growers around the globe the choice to find a company or product that fits him or her best. On the flip side, the hydroponic market is also one that is filled with confusion, misconception, rumors and unfortunately lies. In that regard we wish to create a little clearance about CANNA.

CANNA

Research Laboratories

We have noticed for a while now there is some confusion about CANNA. The main reason seems to be that competitors claim to have a connection with CANNA. Or even try to make people believe that CANNA itself spreads the word to have a connection with other (Dutch) companies. This by NO means is true! Some of the fairy tales you might have heard include: owners of competitive companies have founded and developed CANNA or designed CANNA nutrients and then started their own company. They say CANNA does not have their own facilities and that they are the ones who bottle the CANNA products. CANNA is the same product as theirs or an older formula of their "better" product. There's even a story about CANNA just being a marketing department of one competitor and so on. These companies also try to make people believe they are big(ger) or even the leading scientists in Holland/Europe, after all, who

will check whether that's true? And on top of that, if these companies choose to pack their products in bottles similar to CANNA's, we understand these lies all may sound very believable to people but again none of them are true. Since these companies don't officially claim such a thing in (published) media or documentation we will not mention the company names involved at this point. All of these false claims seem like a sales pitch and might not even be instructed by the companies' upper management. Still, the word seems to be traveling and there will always be people believing nonsense without doubt. Although we feel kind of flattered it turned from a good laugh into a more serious, unfair and above all untruthful way of conducting business. As CANNA is a company strongly believing in honesty being the best policy and chooses that as their way of conducting business, with grower's interests at heart we hate for them to fall victim



CANNA

Grower's TIP #14

REPLACING LIGHT BULBS

to others and their untruthfulness. To enervate rumors we would like to tell a little bit more about our company and products.

True Research

CANNA is owned by its founders up to this very day. They are the ones who build this company and made it the worldwide success it now is. Opposite to what many companies only claim, CANNA is just one of the few within the industry that truly has its own research department located on multiple locations in several countries in Europe and North America. This enabled CANNA to design all of the CANNA products in our own laboratory and test the products over and over again in our own test facilities across the world before bringing it to the market.

Pioneer

CANNA is proud of its pioneering role within the hydroponics market. When CANNA developed CANNA COCO as a growing medium it shocked the market. Only few people were used to growing on coco at that time and were limited to growing solely on coco bricks. CANNA introduced the loose fill to the market, in combination with CANNA COCO nutrients that were specially designed for the characteristics of CANNA COCO medium, a perfect match! Nowadays growing in coco is very popular, it concurs (and often beats) the traditional growing in soil culture. Nonetheless, CANNA was the first to bring it to the retail market.

Product Development

There are people who think CANNA hardly introduces new products. We often hear this comment and the truth is we do launch new products but, only if they are consistent with our current products. In other words, only if they are truly useful for the grower and the product range we already offer. A fair deal we would say. After all, it's about quality not quantity. Nonetheless, there seems to be an unstoppable demand for new products and especially additives. Instead of just quickly filling the need for that demand we choose to only launch a new product when we strongly believe in it, it has been tested numerous times and growers will experience better results with it.

One of our last introductions was CANNABOOST (2007). Please send any (negative) comment on it to info@cannagardening.com. So far we've received zero negative feedback responses from the huge and increasingly knowledgeable crowd of (indoor) growers around the world. Another confirmation that our extensive research is worth the patience and price of the product. We know CANNABOOST is costly but the results are in line with what you pay for the product. Besides, with other brands you often need several products to obtain the result CANNABOOST gives you in 1 bottle. We also believe in improvement. And with the ability to keep testing our products, the feedback we get from the market and the experience we gain over time we are able to keep enhancing already good products like we did with CANNAZYM in 2010. It is easy to claim a product is new and improved. But to discover a totally new way of making the product work even better is something else. Together with the New & Improved CANNAZYM we also updated our Do-It-Yourself test which is a tool to test the active enzymes in any enzyme product. If you want to have tangible proof about the quality of your enzyme product, do this test! It will also show you the differences between CANNA's and competitors' products. (Go to www.canna-hydroponics.com/cannazym and watch the clip that shows you how to perform the test).

Future

Although we pride ourselves in doing the proper research & development we also acknowledge a sincere and true demand for several type of products that we don't have in our range yet but could be of direct added value for the grower. Often this is related to (slight) changes in growing techniques and growing cultures over many years. We are honestly working on product development 24/7. At the right time, we will launch the right products and you can count on the quality, consistency and a genuine purpose of the product. After all, Quality proves itself!

Until that time, don't be fooled by make believe Robin Hood stories....

Many growers wonder how often they should change their light bulbs. Opinions on this subject differ greatly. Some growers think they can save money by not changing their light bulbs until they stop working. But changing your bulbs at the right time will actually save you money, because a new bulb will give the maximum quality and quantity of light while using the same amount of electricity. But how do you know when is the right time?

After about three years, one in ten grow lights will stop working. After approximately seven years, half of the lights become defective. However, the amount of light energy that your bulbs emit will fall long before they actually go pop. If for example you light your plants for 12 hours a day, after 30 weeks your bulbs will be emitting 5% less light than they did at the start. For some plants, like chrysanthemums, this means you will get 5% less harvest. Other crops - roses for example - are only affected once the light becomes 12.5% dimmer. The quality of the light also deteriorates. As your light bulbs get older, the light will shift slowly from the visible part of the electromagnetic spectrum to infra-red light. Infra-red light is heat, so your green house will get warmer. If you are growing tomatoes, for example, this can cause your tomatoes to burst. It can also cause your plants to burn.

How can you test whether your light is less bright than it should be? Unfortunately, this is not easy. Measuring methods (using a lux or a PAR-meter, for example) require great precision, and the human eye is only capable of spotting a 10% difference in brightness, but actually if the light gets dimmer very gradually, the difference is almost impossible to spot with the naked eye.

A good rule of thumb is to change your light bulb every 30 weeks, provided the fall in crop yield means a bigger loss than the cost of a new bulb. If you don't change your bulb, your crop yields will fall and fall, and the quality will also continue to decline. This will cost you more money in the end.

The grateful gardener





NEW LIGHT SYSTEMS

LIGHT IS ESSENTIAL TO PLANT LIFE. PLANTS TURN LIGHT INTO SUGARS, WHICH THEY NEED FOR GROWTH AND BLOOM. INDOOR CROPS HAVE TO PUT UP WITH ARTIFICIAL LIGHT, WHICH IS NOT ALWAYS SUFFICIENT. BUT MAYBE THIS WILL ALL CHANGE VERY SOON...

WE ARE ON THE VERGE OF A TECHNOLOGICAL REVOLUTION IN THE WAY THAT WE PROVIDE OUR INDOOR CROPS WITH THE LIGHT THEY NEED. SUPPLIERS ARE PROMISING MORE EFFICIENT WAYS OF USING ELECTRICITY, AND NEW COLOURED BULBS AND LED LIGHTS ARE TAKING THE MARKET BY STORM. THE QUESTION IS WHETHER THESE PROMISES ARE REALISTIC AND WHETHER GROWERS HAVE THE SKILLS TO BENEFIT FROM THEM.

By Pieter Klaassen, BSc

Plants and light

In order to understand the way these light systems work, it is necessary to first explain what light is and how it affects plant life. Light is a form of radiation and as such can be divided into different wavelength categories: visible light, invisible radiation, near infra-red and infra-red.

For plants, light is essential in the broadest sense of the word. Without it, none of its vital processes would be possible: The plant uses light, water and CO₂ to make carbohydrates and oxygen (photosynthesis) The color (wavelength) and the amount of light determine the shape of a plant (photo-tropism) A plant 'knows', based on the day length, when to produce flowering hormones and flowers (photo-periodicity)

Photosynthesis

When light reaches a plant's leaves, it is absorbed by cells containing chlorophyll. The two most important forms of chlorophyll, chlorophyll a and b, are most sensitive to blue and red light (see figure 9).

Theoretically these two colors of light alone would be enough to allow the plant to photosynthesize, but in reality every wavelength in the spectrum has its own function in the plant. Usually green and sometimes yellow light are partly reflected back, which is why most plants appear green to the human eye.

Photo-tropism

The way in which the plant grows is not only determined by its genes, but also depends on

wavelengths of light it is exposed to, including both visible and invisible light. UV-a light (315-380 nanometer) and UV-b light (280-315 nm) have a positive effect on the growth of new branches and further have a similar effect on plants as blue light, although there are some differences. Too much UV-c (<280 nm) can damage a plant. Far-red light (700-800 nm) penetrates more deeply into the crop than other wavelengths, resulting in a plant, or parts of a plant, to grow and stretch towards the light source.

Photo-periodicity

Many flowering plants use a photo-receptor protein to sense seasonal changes in night length, or photo-period, which they take as signals to flower. These plants are classified as long-day plants or

short-day plants, though the actual regulatory mechanism is governed by hours of darkness, not the length of the day. A long-day plant requires less than a certain number of hours of darkness in each 24-hour period to induce flowering; these plants typically flower during late spring or early summer. Short-day plants flower when the night period is longer than a critical length. They require a consolidated period of darkness for floral development to begin, but the specific length of the dark period required differs among species and even varieties of a species. Day-neutral plants flower regardless of the night length.

New light developments

Now that we have a better understanding what light is and how it effects the growth and flowering of plants,

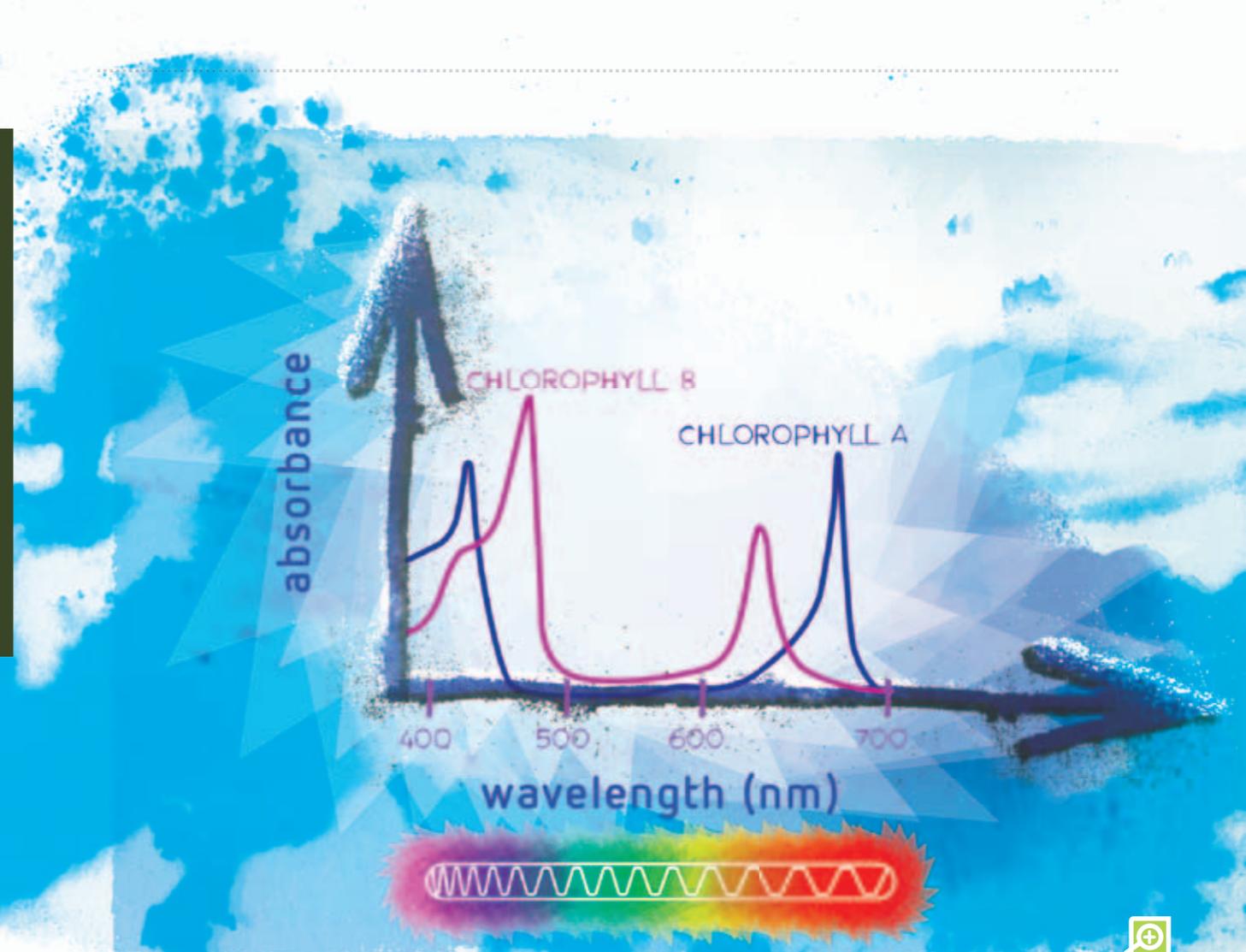


Figure 9: The two most important forms of chlorophyll are most sensitive to blue and red light. Chlorophyll is critical in photosynthesis, which allows plants to obtain energy from light.





NEW LIGHT



Figure 10: High pressure sodium lamps in a greenhouse

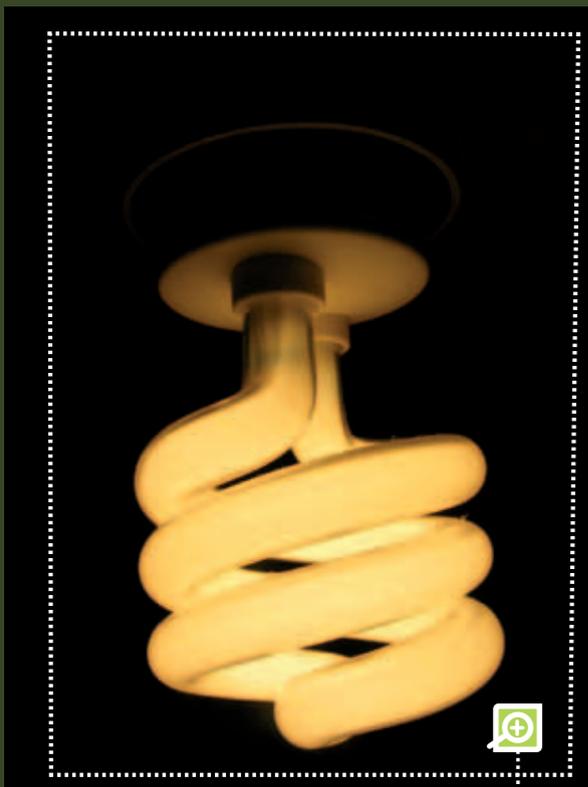


Figure 11: Fluorescent grow light

we can look at some of the new lighting technologies that have emerged in recent years. The most common type of photosynthetic lighting in horticulture today is High-intensity Discharge (HID) lamps. These contain a mixture of gases and metals enclosed within a glass tube. As electricity passes between the electrodes at the ends of the tube, the gas-metal mixture heats up and emits light. HID lamps can be either high pressure sodium (yellow light) or metal halide (white light). Sometimes a combination of both types of bulbs is installed to give a more uniform spectrum, while reflectors are used to direct the light toward the plants (See figure 10).

Better bulbs

Until recently, fluorescent grow lights (figure 11) have had a low output and have been too big and bulky to be of much use as a grow light for anything more than starting seedlings. This has changed with the appearance of new compact fluorescent or CFL and T5 full spectrum fluorescent lights. These improved light bulbs are growing in popularity for both propagation and plant growth, as they are energy efficient and extremely effective, especially when used in numbers. While not quite as efficient as HID lights, fluorescents have better color rendering properties and produce much less heat when compared to HID lights. This allows them to be placed closer to plants greatly increasing their effectiveness.

LED

The application of light-emitting diodes (LEDs, see figure 12) as potential source for assimilation lighting in plant production systems potentially opens up a range of new possibilities. LEDs produce light in a very narrow wavelength range and do not directly emit heat radiation.

The heat which is produced by LEDs due to their limited energy conversion efficiency can be drawn away via convective cooling. As a result, LEDs can be applied at relative dark places close to the crop, in order to increase leaf photosynthesis at locations where assimilation light normally doesn't penetrate. In theory this type of inter crop lighting could significantly increase crop photosynthesis.

At present most commercially available LEDs only emit red and blue light. Even though these are the wavelengths that plants use for their photosynthesis, they are only to be used in conjunction with other forms of lighting, as supplementary lighting or directable lighting. Although new LED systems cover a much wider spectrum, these are mostly still in the experimental stage.

Plasma lighting

Plasma lamps produce a light spectrum similar to that of the sun and are therefore sometimes referred to as artificial sunlight. Plasma lamps use a small amount of sulfur which is excited by a magnetron, causing light emitting plasma to emerge. Under laboratory circumstances, when compared to



Figure 12: A LED light

plants grown under fluorescent tubes and high pressure sodium lamps, plants grown under artificial sunlight are characterized by longer petioles, a greater leaf unfolding rate and a lower investment in leaf mass relative to leaf area. This means plants grow bigger and accumulate more dry matter, even though the photosynthesis per leaf area is not greater. The large differences in plant response to the artificial sunlight spectrum compared with the widely used protected cultivation light sources highlights the importance of a more natural spectrum, if the aim is to produce plants representative of field conditions.

Conclusion

A plant needs specific wavelengths of light according to the stage of growth that the plant is in. LEDs, plasma light and specially colored bulbs require further development before they can be made into products for growers. LEDs are already available for use as supplementary lighting or directable lighting, but it is still up to the grower to judge what his plants need at that particular moment. •

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Puzzle & WIN

great prices



WIN A BOTTLE OF CANNA RHIZO TONIC

Because of the great success of the last puzzle, we have another 'spot the difference' game for you in this issue. So, can you spot the 5 differences? It's worth a try, because the one who impresses us most with his/her answer wins a 1 liter bottle of RHIZOTONIC! That's right, CANNA's root stimulant, which will give your plants resistance and strength! So keep your eyes peeled for those differences and send in your answers to editor@cannatalk.com. Mentioning CANNAtalk ed. 14!

Winner
puzzle #12

We picked a winner at random from all the correct entries we received, and we would like to congratulate

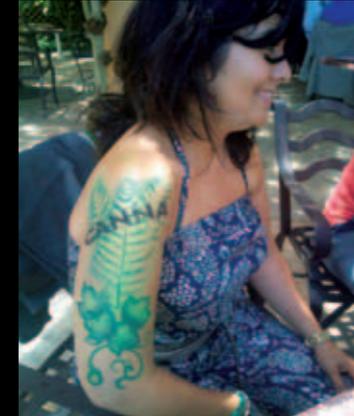
Mr. J. Ames.

You have won a supply of CANNA Aqua Vega and Flores!
We will contact you as soon as possible to arrange the dispatch of your prize.



CANNA at 33rd edition of:

HARMONY FESTIVAL



From June 10th to 12th CANNA sponsored the annually held Harmony Festival. The location: Sonoma County Fairgrounds in Santa Rosa, California, a perfect spot for this festival.

Harmony is a festival devoted to a greater appreciation of health and ecologically conscious audiences, through showcasing world class, cross-generational entertainment, music, art, dance, healthy food and sustainable community development. This was the 33rd edition of Harmony and with over 35,000 visitors it was a great one! Some of the artists performing this year included Primus, Michael Franti and Spearhead, The Flaming Lips and G Love & Special Sauce.

CANNA was a proud sponsor of this festival and so two of our CANNA girls welcomed the audience in one of our tents at the main entrance. The biodegradable "Bloom Cards" they handed out were much appreciated. These cards contained little flower seeds. The cards need to be put in soil and flowers will grow from them. Our 2nd tent was located in Eco-Village, an area to increase awareness about conserving our Earth's environment. At this tent people could receive more information about growing and our products. One of our Preferred Dealers "The Garden Spout" was willing to help us inform all the attendees that were curious and interested in learning more about CANNA during the festival weekend.

On Saturday we had a body painter who painted our CANNA girls and anyone who was up for it could receive a tattoo of choice. People were very enthusiastic about the body painting and wanted to have their picture taken with the girls or get a tattoo themselves.

Harmony Festival has been a great experience for us and we would like to thank everyone that came to visit us. We had a great time!



WHAT'S NEXT

Choosing the right growing system can make or break your growing career. If you are just a beginner, you might want to start with a simple system. Just a watering can, a light and potting soil in pots can be sufficient. If you're more experienced, you could get bigger and richer harvests with a more elaborated system. Read everything on growing systems in the next issue of CANNAtalk. Of course, we'll also talk about non-growing related issues. Last time, we promised you an article about parkour and free running. Unfortunately, we had a little change of plans. But this time, it's for real... Getting from A to B in a straight line, no matter what kind of object is in your way. Free running, man, the word says it all.

GROWING SYSTEMS



RootMaker®

The original root-pruning container system.

The **RootMaker®** System provides unparalleled success for healthy root propagation, plant maintenance and transplanting. Patented design creates fibrous, non-circling root system, which in turn will give you increased growth rates and higher yield.

BENEFITS

- Prunes roots to create a fibrous, non-circling root system. (without toxic chemicals)
- Greater efficiency of water and nutrient absorption.
- Wide range of sizes. (propagation to large containers)
- Increases plant growth and yield.
- Plants are equipped for rapid transplant success and long-term health.
- Researched and patented.



MAXIMIZE PLANT SUCCESS WITH HEALTHY ROOTS

Every gardener knows that roots have an important job in the health of a plant by anchoring the plant and extracting water & minerals for nourishment. The root mass and the number of root tips is directly related to the size and yield of a plant.



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CANNAtalk

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