CANNAtalk®

MAGAZINE FOR SERIOUS GROWERS

ISSUE 33 2016

PROPAGATION

Types and tips

PASS THE PEAS

A fairytail come true?

GRAFTING GALORE

Mix, match and merge

And more:

HQTalk:

As you know, at CANNA, we always strive to achieve the highest quality possible. We use the best raw materials, the best production processes and we do many tests all to ensure we give you 100% quality in our products. You might recognise this obsession for achieving the best quality? As a grower, you strive to create the best conditions for your plants in order to get the best performance out of them. Once you have had a great yield, you want to use the same one over and over again. Unfortunately this is not possible, but you can"clone" the plant by taking a cutting from it. In this CANNAtalk we explain everything about cuttings. We even explain how you can take cuttings step by step (page 22).
If you are already a master at taking cuttings, do not be afraid of becoming bored while you are reading this issue of CANNAtalk. We also explain how to grow peas yourself, explain everything about grafting in section 'What's happening' and Don continues his indoor growing and tells you everything about his current situation.

As we said, something for everyone! Before weforget, the European Championship is coming and CANNA has made a European pool. Enter your predictions @ www.canna-euro2016.com and win a trip to Amsterdam!

Don't forget, the more you read the more you know.

Regards,

Karin

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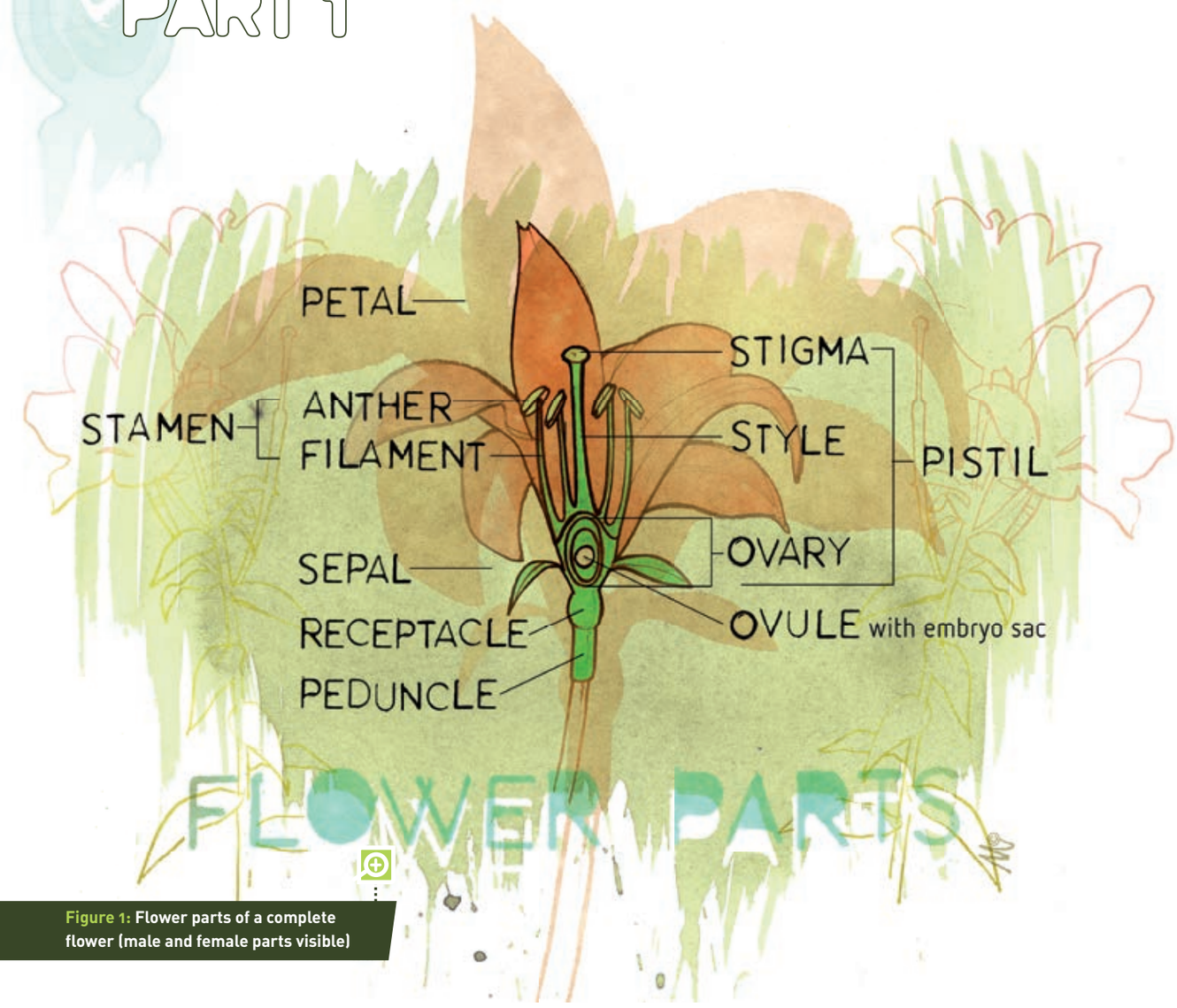

Figure 1: Flower parts of a complete flower (male and female parts visible)

PLANT PRODUCTION HAS TO START SOMEPLACE. SURE, IT BEGINS WITH PROPER PLANNING, LOCATION DESIGN, EQUIPMENT ACQUISITION AND INSTALLATION, AND SO FORTH, BUT ACTUAL PRODUCTION STARTS WITH...WELL...THE STARTS. STARTS, FOR THIS PURPOSE, ARE DEFINED AS THE PLANT INITIALS ETHER BEGUN THROUGH SEXUAL OR ASEXUAL PROPAGATION.

By Geary Coogler BSc Floriculture / Horticulture

Types of Propagation

Sexual propagation is the term used where two parental lines are involved that form an embryo. It may or may not be encapsulated in what is known as a seed coat and involves the fusion of two separate gene sets. Asexual propagation is where a piece of the original plant is used to form an entirely new plant with the same tissue set as the original plant, including any localised mutations or specialties. Another type of asexual reproduction is cloning where the gene set from a single cell that is undifferentiated into any plant parts is forced into differentiating into plant parts so that it and all subsequent plants started from this cell are exactly the same gene sets in every way. This is known as cloning usually involving a process called Tissue Culturing.

Sexual Propagation

Sexual reproduction in all plants involves the fusion of two different sets of genes, sometimes from separate parents and sometimes from the same parent. In the Angiosperm division of plants (flowering plants such as tomato, cacti, grasses, and so on), the largest most diverse group, these gene sets in the embryo are encapsulated in a seed for protection. In Gymnosperm plants, this new future plant is not and remains naked to the elements (pine, spruce, other evergreens). In flowering plants this involves the male contribution (pollen) from a different or same source plant (monecious or dioecious) being transferred to the female part of the flower (known as the Ovary), which contains the egg or Ovule. The gene sets fuse and a new seed is formed. (see Fig 1)
This process allows for the greatest amount of genetic diversity possible. All cells from which the half set of chromosomes (the gene structures), from which the pollen and ovule arise, have two sets of the same genes. For instance petal shape could be a single gene set, and the plant cell will contain two of these, even though one set may be different in what shape it may produce. At the formation of the ovule or pollen grain one set will be in one ovule or pollen grain while the other will be in a different ovule or pollen grain. The one that fuses with the other at pollination becomes a part of the new plant and is passed on. Thus the new plant is a part of both and not of a single set of genes or of a single parent gene set. (see Fig 2) The problem is, unless it is a very stable gene set, the grower never knows exactly what they will get until the seed germinates and grows. These differences can be anything seen or not seen. Two seeds produced apples may look and grow identical but one set of fruit may be small green and bitter while the other is big, red and tasty. Many more ultimate plants can be produced with seed, and they can initially be stored for periods of time with minimal concern, but the grower sometimes has no idea of exactly what they are getting. Additionally, unstable gene sets on many varieties, even though always produced from the same parent lines, will produce as many gene sets as seed. The fact that most plants can be propagated from cuttings or divisions greatly improves a grower's chance at producing successful and similar plants and crops.

Asexual Propagation

Asexual reproduction is the utilisation of an existing plant part or full gene set to produce a similar or same plant. That covers a bunch of ground. To facilitate this discussion, the subjects will be split up and dealt with separately. The emphasis of this article is in cuttings, the most important method for propagation as used by growers to ensure consistency in crops. To begin this conversation, it is important to keep a few things in mind.

1. One thing to remember is that the genes in any cell, at any time, can mutate. This is a process by which outside influences such as: high energy light, cell division, chemical processes, time/ age and many other ways, affect the expressed gene sets. The result is that seldom does the gene set in the plant cells at the tip resemble, with 100% accuracy, the cellular gene set as a fertilized ovule. This can lend itself to many new expressions such as: better fruit, different leaf form, size, colour patterns/ variegation and so on.

2. Another thing to remember is that putting roots on a cutting is simply continuing the plant development away from the original plant stock. Cells away from specialised areas inside the meristems of a plant have a specialisation and a purpose. A leaf epidermal cell will divide into the same type cell but, in these specialised areas, cells in new plant parts take on their specialisation as they are laid down, though start as undifferentiated cells (or collectively, tissue). At some point, a change has to occur to get tissue to change and become undifferentiated once more, in order to become new roots or entire new plants.

3. Finally remember that gene sets never reset the clock on the time or age. This can be extended but there remains a limit. For example an apple tree may have one limb that produces a slightly better fruit from a mutation in the axillary bud it originated in. If a bud is taken and propagated by cutting, then the new tree will carry the same good fruit and can be propagated into hundreds and thousands of new trees. The age of the gene set will always remain timed, based on that

Figure 2: Sexual Reproduction – the Fertilisation process

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original tree gene. It can be extended but a couple things happen over time: the genes become tired and more mutated, and sooner or later the entire line will die out at roughly the same time.

Cloning

The taking of any vegetative propagule can be argued to be the cloning of the original plant so there should be no difference in terminology. However because the horticultural world treats the two areas as distinct, and because there are true minor differences, we will speak to the two basic forms of vegetative reproduction. Cloning is the process where a piece of tissue is taken from a viable area of a mother stock plant. It is then forced back to an undifferentiated state (callus), where it is then broken up into individual cells and these cells all being almost a 100% gene match, and then allowed to grow into more callus. The callus is then introduced to certain ratios of minerals, hormones, enzymes etc. and produced into a new plant, each virtually identical to the others. This process is intense and subject to many failures along the way. In the process, it tends to produce enormous numbers of new plants. This means that it is great for producing commercially needed numbers to keep costs lower, but expensive and over-powering for smaller gardens.

There are many variations on this process, all considered Tissue Culture, but the above serves as an easy example. (See Fig 2) Virtually all plant parts have or might have some importance or place in this technique. Meristem culture, or micro-cuttings is more like a cutting but only the tip meristem with a couple new axillary buds are excised from the plant and they then grow roots and a new plant. The advantages are numerous, such as virus or disease indexing, but expensive is the word. Most importantly, all plants respond independently to this technique, what works on one species does not on another. A tremendous amount of research has and still goes into developing: the profiles and techniques needed, correct chemical balances and even the correct timing for things to occur. The equipment requirement to conduct this propagation method is extensive and has to be totally sterile. There remains easier ways. (See Fig 3 and 4)

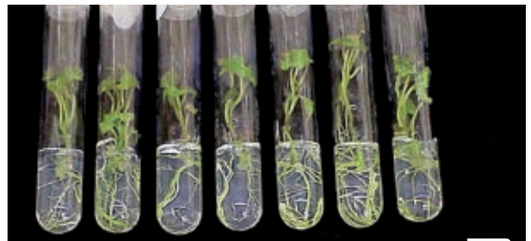

Figure 3: Finished Tissue Culture plantlets ready for transplant
Figure 4: – Incubation rooms with technicians

Vegetative Cuttings

The method of choice (in cases where it is possible as not all plants lend themselves to propagation by tip or leaf/eye cuttings) is the taking of cuttings. Vegetative propagation includes plants that arise from adventitious buds on the root itself and the root is divided to produce separate plants (division), or other vegetative methods. It also includes the sectioning of stems to include active leaves, tip or leaf/ eye cuttings, or dormant apical or axillary buds known as dormant cuttings. The idea is that the plant with an active growth tip meristem, axillary bud, or dormant bud will either root through the change of epidermal tissue or callus formation at the cut, into a root meristem and form a new connection to the vascular tissues. This is also possible through specialised structures such as aerial roots/holdfasts, or arising from the leaf node tissues to produce a new plant and root system. Many possibilities exist and all plants can be different. Some

Figure 5: The basic idea in Reverse Osmosis is to pass water through a membrane leaving almost everything behind. Plants do this by natural forces involving gradients. This machine does so by forcing the water through the membrane.

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plants will also respond in multiple ways. (See Fig 6 and 7) When this new root systems develops, if the plant has an active more centralised crown, at the junction of the root vascular system and the top vascular system a new crown is formed and must be dealt with correctly. Some plants have less identifiable crowns or have the ability to root readily along the stem, in which case are less concerning. Crowns tend to be areas of high-energy use and can require larger amounts of Oxygen to function correctly. While the cutting, when disconnected from the root tissue will usually put on new roots, these new crowns will not respond well to being buried deeply and will generally not root or die before new roots form, causing issues with the top portion at the least.

These activities are triggered to occur by combinations of triggers such as light levels (or lack thereof), hormone accumulation and/ or disappearance, starch accumulation and other activities including stress. Some readily rooting plants such as Ficus spp. will root from the stem and nodes when the humidity is high and light levels lower. Aerial roots are produced that grow to the ground, converting from an aerial root into a normal root to help supply the needs of the plant. The roots that do form tend to be designed for the environment in which they arise such as in water based systems or soil based.

Conclusion

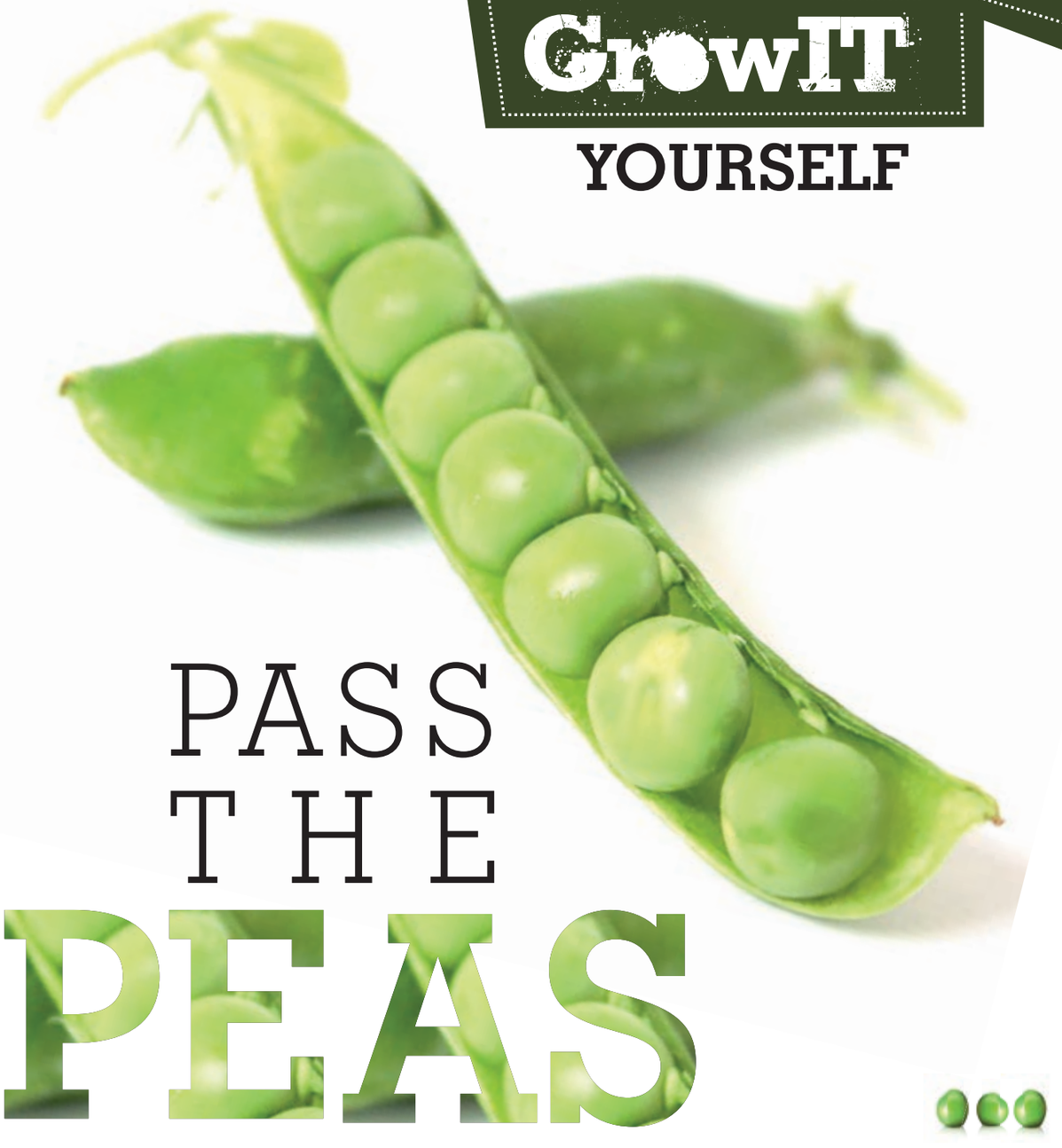
Plants tend to lend themselves to being propagated. It is as if they figured out how to keep a single copy of

Figure 6: Adventitious root initial from epidermal tissue change as well as Callus root initials at cut end of propagule.

their genes going forward when it is really a survival mechanism from long ago perhaps. To maintain all the desired characteristics, the only true way to achieve this is through vegetative propagation. It is possible to stay close with stable gene seeds that are non-hybrid, but still a risk of mutation remains much higher. Also, a vegetative propagule tends to reach maturity faster as its tissues remaining at the same maturity of the stock or mother plant, for example juvenile verses adult tissues.

In the end, there are many techniques to use in propagation. They can all be difficult or easy so the grower must select the best, most practical and successful way for accomplishing their needs based on the plant, as all will be different. Learn more about taking cuttings on page 22. •

Figure 7: Adventitious and Callus roots form from the initials



PASS THE PEAS

AW, ISN'T SHE ADORABLE: ROUND AND SWEET, VERSATILE AND HEALTHY. THIS ULTIMATE COMFORT VEGETABLE USED TO BE WHITE AND HARD. PEAS ARE GREEN NOW THANKS TO A MISCHIEVOUS FAIRY BOY AND THE MERCY OF THE FAIRY QUEEN IF WE MUST BELIEVE THE LEGENDS, AND WHY SHOULDN'T WE?

By Marco Barneveld, www.braindrain.nu

Once upon a time pods and peas were white and the peas were hard. Nobody cared about them because they looked unappetizing and because they were always dirty and too hard to eat. A fairy boy used them one day to shoot them from his blowpipe at his teacher. He was caught. His punishment was that he had to turn all pods and peas

into a lush green and make the peas soft and sweet so they couldn't hurt when shot from a peashooter. The boy worked and worked but there were just too many. The Fairy Queen noticed and took pity on the fairy boy. With one wave of her powerful magic wand she turned them all into what the teacher demanded: green pods with green peas that are soft and sweet. Or at least so it's told. You've got to love myths and legends.

Sub-Himalayan

For the less romantic and more scientific souls out there, sweet and delicious green peas are one of the ancient cultivated vegetables grown for their succulent nutritious green seeds. Peas probably originated in the sub-Himalayan plains of northwest India. Today, this versatile legume is one of the major commercial crops grown over all temperatures and semi-tropical regions.

Botanically speaking, the pea plant is an herbaceous vine. It belongs to the family of Fabaceae, in the genus Pisum. Scientific name: Pisum sativum.

The pea plant is a quick growing, annual herbaceous vine which requires trellising to support its growth. It flourishes in a well-drained, sandy soil supplemented with adequate moisture and cool weather conditions. Short stalked, green pods appear by late winter or early spring. Each pod measures about 2-3 inches long. They can be: swollen or compressed, straight or slightly curved and filled with single row of 2-10, light green, smooth edible seeds we call peas.

In general, pods are harvested just short of reaching maturity: at the point when the peas are green, soft, sweet and edible raw. Allowing the pods to mature further would make the peas less sweet, bitter and light green to yellow.

Health benefits

We don't usually think about green peas as an exotic food in terms of nutritional composition, but we should. They contain a unique assortment of health-protective phytonutrients. One of these phytonutrients, a polyphenol called Coumestrol, has recently come to the forefront of research with respect to preventing stomach cancer. A study based in Mexico City has shown that daily consumption of green peas (along with other legumes) lowers risk of stomach cancer, especially when daily coumestrol intake from these legumes is approximately 2 milligrams or higher. One cup of green peas contains at least 10 milligrams, a great reason to pass the peas daily. Even though green peas are an extremely low-fat food, the type of fat and fat-soluble nutrients they contain is impressive. Recent research has shown that green peas are a reliable source of omega-3 fats. In 150 grams of green peas, you can expect to find about 30 milligrams of these fats. This sounds very small, but this high-quality fat content of green peas helps to provide us with important fat-soluble nutrients including sizable amounts of beta-carotene and small but valuable amounts of vitamin E. Yes, pass those peas.

Environmental friendly

Green peas also stand out as an environmentally friendly food. Agricultural research has shown that pea crops can provide the soil with many important benefits. First, peas belong to a category of crops called 'nitrogen fixing' crops. With the help of bacteria in the soil, peas and other pulse crops are able to take nitrogen gas from the air and convert it into a more complex and usable form. This process increases nitrogen availability in the soil without the need to add fertiliser. Peas also have a relatively shallow root system, which can help prevent erosion of the soil. Once the peas have been picked, the plant remains tend to break down relatively easily to replenish the soil. Finally, rotation of peas with other crops has been shown to lower the risk of pest problems. Grow the peas? Grow the peas.

Grow it yourself

St. Patrick's Day is the traditional time to plant peas in Northern Europe. If your garden soil is workable and not too wet, get your seeds in the ground. To speed up germination, soak the seeds in water for at least a couple of hours before planting. After planting, keep the seeds well watered. If you have the space and are afraid of slugs, snails and mice, you may want to raise them indoors in individual pots 8cm deep or in root trainers. Once the plants are around 15cm tall, plant them outside.

When your pea plants are a couple of inches tall, think about offering them support so they won't topple over into a tangled mess. Depending on the variety, pea plants can grow up to 6 ft. tall. Trellising is your first option. The stakes for the trellis are fastened securely to the raised bed with a screw gun. Once the stakes are in position, netting is stapled to them. Another way to support peas is to build a four-pole tipi, and a third way is to use brush offcuts. Here's a tip you might not have thought of: fasten your pea vines to their supports with strips cut from old stockings or panty hose. It's smart recycling, and it stretches as the vine grows.

Harvesting

The trickiest thing about harvesting peas is knowing when they're ripe. You don't want to pick them when the peas are undersized, but if you wait too long the peas will lose their sweetness and turn bitter. Morning is the best time to pick because the sugar content is at its highest then. At peak ripeness the outer shell will be bright green, not dull and waxy. Continue to pick the vines as the peas ripen. If you do that, the plants will keep flowering and continue to produce pods, at least until the weather gets really hot.

Prepping the peas

The first task in pea prep is shelling the peas. If you plan on freezing them, follow these steps to preserve their flavour and colour. When picked, the sugars in peas turn quickly to starch, but you can stop that process by blanching. Cook the peas for a couple of minutes in salted boiling water until tender. Follow this up by dunking them in ice water to set the sugars and preserve the bright green colour. Next: drain and dry the peas, then spread them out on a baking sheet covered with parchment paper. That way, the peas will freeze separately, without clumping together. Put the baking sheet in the freezer and once the peas are frozen transfer them to a plastic bag for long-term storage.

Eat it yourself: Fresh Snert

The winters in The Netherlands can be cold and the Dutch love to skate on the frozen rivers and lakes. There is nothing better than a hot steaming cup of snert, Dutch pea soup, when you leave the ice. Originally the soup is made with split or dried peas but it's even better with fresh peas from your own garden. For the vegetarians amongst our readers, just use a vegetable broth and leave the meat out. •

RECIPE

FRESH SNERT

For two litres you'll need:

- 2 litres of water
- 1000 grams of fresh peas
- 500 grams of streaky bacon (cubed)
- 1 big carrot
- 1 big leek
- 2 leaves of laurel
- 20 grams of parsley
- Half an onion
- Half a celeriac
- Pepper
- Salt

Boil the water gently with the cubed streaky bacon and the laurel. Take out the bacon and add the peas. Blend. Add the bacon again. Also add the carrot, the leek, the parsley, celeriac and onion. All cut small. Let it simmer for about 30 minutes. Add pepper and salt to taste. Put on your skates, wear an orange shirt and

ENJOY.

Questions & Answers

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

Question

Hi there. I use your full range of Coco nutrients, every single one! Can you please tell me if it would hurt or be beneficial using silicon, or humic and fulvic acids?

Answer

Firstly, the quick answer: Our Coco nutrient contains humic and fulvic acid, so there is no need to add extra.

Secondly, about silicates, that is another story altogether. The world is made mainly out of silicates. That means that you will find everywhere silicates; sand, glass, but also dust, substrates and normal tap water etc. We don't add extra silicates to our nutrients (but you will find them if you analyse it), because we didn't see any improvements in our research trials. However, there is one exception to this rule: CANNA AQUA, because these nutrients can be used in an aeroponic system without any substrate in combination with "clean" soft water.

Plants do take silicates, that is a fact, so that must come from the "pollution" of the water, substrate or nutrients. However adding more doesn't give any improvements, unless there is none in the water or substrate itself (like aeroponic growing). Some crops do respond well to extra silicates (like cucumbers) but then some crops get an excess (like strawberries). However, most crops show no difference. It means most plants take what they need, as long it is there in the substrate, water or nutrient "pollution".
Silicates can be given in two ways, as an acid or as Potassium silicates. Both ingredients are very prone, given at normal EC and pH, to block your irrigation system. Nevertheless, sometimes you hear positive stories about it. Why is this?
When the grower replaces CANNA PK 13/14 for Potassium silicate, the effect they see is the effect of potassium and not that of the silicates. The same with silicic acid. The positive effect they see is created by growing at a better, more stable pH. So when the grower has a good pH control or CANNA PK 13/14 control at the first place, the effect is negligible. However the chance of a blockage in the irrigation system becomes an issue. On the other hand we didn't see excess either, as long as you use a normal dose. So according to us it is a waste of money to add extra.

Last but not least: Some people claim stronger and thicker stems. But this is actually a disadvantage. It means that more energy from photosynthesis was used for creating thicker stems. That means less energy is left over for creating flowers or fruits. So CANNA doesn't add extra silicates into the nutrient or sell it as a mono, because we still cannot prove a positive need or effect in any way for the plant. But again for one exception: when using CANNA AQUA for aeroponic systems in combination with extremely soft water.

Question

Hi, I have a question about CANNA AkTRIvator, can I use it with CANNA Coco Natural medium and rest of the CANNA family products, such as CANNAZYM, Boost, PK13/14 etc.? Cheers

Answer

Yes you can indeed, but you have to add it into the Coco before you start growing. And of course we tested AkTRivator to work perfectly in combination with all of our products. Good luck and happy growing!

Question

Hi CANNA, I'm using CANNA COCO range with CANNA Coco Pro Plus . I was having the odd problem where I was using ro water. Since I've been using your new CALMAG AGENT all my problems have gone. What I do want to know though is should I stop using the cal mag in flower due to the extra nitrogen or even half the dose? Any info on this would be appreciated. Apart from that I'm very happy with your nutrients and I've been using them for many years now.

Answer

We are happy that our CALMAG Agent did solve your problem. With this product we aim to 'fix' tap water that is too soft or too hard. Normal tap water contains calcium and magnesium which R.O. water doesn't have. So after you made "normal" tap water by topping it up with CALMAG AGENT to an EC of 0.4, you can use the normal dose of the CANNA Coco A/B nutrients.
Most of the nitrogen will be absorbed by the Coco substrate, but if you see soft vulnerable plants, you can start earlier with a half dose (0.5-1.0 ml/L) PK 13/14 added to the nutrient solution.

Question

Hi, thank you for answering all my previous questions, I really appreciate it. Sorry for all the hassle but I have 3 more. On the back of the coco a+b bottles it says to mix then let it stand for several hours. Is there a minimum and maximum time? As I used to just mix and use when in the Terra, but now I am going to have to add this stand time to my busy schedule. The CANNACURE concentrate bottle says not to mix and keep for longer than 10 days prior to using, yet it comes as a spray bottle already mixed, what is the difference that makes the spray keep for longer? In Terra I used a pH of 5.8 in veg and 6.2 in flower. What should I use for coco, is it 5.5 in veg and then jump to 6.2 in flower? Should I use canna aktivator in coco? I sometimes still use terra, is AkTRIvator good for Terra also? Sorry, that was five questions. Very kindest regards

Answer

Standing time? That depends on the water quality. Hard water can increase the pH very quickly after you have made the solution. Therefore a second check is needed before giving it to the plants. But for soft water you can actually give it right away (solution stays stable). When using CANNA Terra the pH is less important because the lime in the Terra will bring it to the right pH anyway.
Nevertheless it influence the remaining amount of your lime buffer, so it is better to give the right pH, to prevent more of your lime buffer than is necessary being used up.
Cannacure: The ready-to-use has a stabiliser in it to keep it longer. We cannot put that one in the concentrate, it is not needed either as the concentrate will stay good for 1 year as long as you don't add water. If you make the spray, we assume you spray it right away. If you don't, we warn you that the product will not keep its effectiveness when stored for a long period.
pH in cocofibres: Yes indeed, 5.5 in veg and 6.2 in flower, but don't jump but every week more than 0.1 higher in general. Actually you should measure the pH in the coco and compensate that pH, between these two numbers.
CANNA AkTRIvator: Yes you can, but in general our (non steamed) coco already contains TRIchoderma. So just add it, if you want to be sure. Using Terra, yes it is more important compared to Coco. As Terra (made from peat) was "sterile" when it is dug up. So all sorts of bacteria can potentially jump in after this. Therefore adding AkTRIvator creates a much more beneficial balance of microorganisms, because you never know what jumped in after harvesting the peat.
No problem, we forgive you ;-)

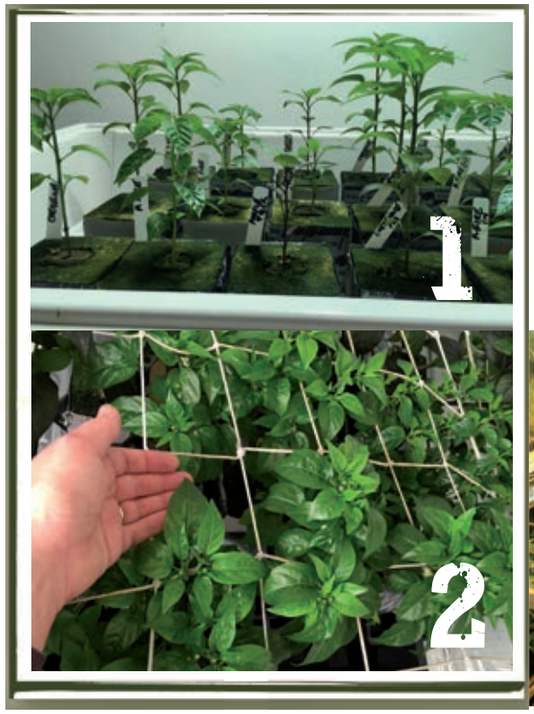
Don & Nicky (PART 14)

Don and Nicky have moved back from Canada to their home country, the UK. Their search for the good life led them to France and they are now doing exactly what they wanted to do with their lives: growing. Don shares his experiences and will tell you everything about the good life in French Catalonia in this, and forthcoming editions.

With my freezer full of tubs of home-grown tomato passata and my jungle of indoor tomatoes finally harvested and taken down, I set about cleaning and disinfecting my grow room. It's amazing how much dust and dirt builds up in just a single growing cycle, but it's nothing some hot water, bleach and elbow grease can't conquer!

hot CHILIES!

My next project? Hot chillies! Not the devilishly hot, inedible kind, but definitely spicier than the Tokyo Hots I grew in coco coir and perlite last year. They sort of lost their poke as time went on and I longed for something hotter. Also, I pledged not to open another bag of coco for a while. Don't get me wrong, I love the stuff, but as a grower it's easy to fall into a rut. Plus I was keen to try something new. First though, the seeds! After some online research I purchased some 'dwarf' chilli seeds. Three varieties: Prairie Fire AGM, Cheyenne F1 and Purple Tiger. My goal was to grow sixteen compact plants in a 2.3 square meter area, so dwarf varieties were a must. Being tropical plants chillies don't really respond to photoperiod as a cue to start flowering, but you can certainly steer them if you let nighttime temperatures drop to 18C (or slightly less) and let the root zone dry out a little between irrigations. However, these particular dwarf chilli varieties have been bred to naturally form a compact shape and size, or at least that's what it said on the seed packet. After a quick germination period, (thanks largely to a heat mat and thermostat) I suddenly had dozens of new seedlings thriving in rock wool starter plugs under a new 250W metal halide lamp (after my T5 fluorescent fixture stopped working months ago). A few weeks later and my young seedlings were happily transplanted into four-inch rock wool blocks. I was irrigating manually at this point: just dipping the blocks, as the young plants weren't particularly thirsty. Also, I had to supplement humidity levels using a humidifier (as relative humidity was hovering around 45%). Many indoor growers have to do this during the early stages.



1 Chilli seedlings in rockwool blocks (4 inch) under 315W ceramic metal halide

2 The first Cheyenne F1 plants pop through the netting Canopy filling up nicely

3 My 'sea' of 16 dwarf chilli plants—even and homogenous beneath 1200W of light.

When plenty of roots were poking out of the blocks I decided to take the plunge and go all out for rock wool in the form of one meter "gro-slabs".

Commercial greenhouse growers can knock two or three massive tomato or sweet pepper plants out of a single slab, so surely I could manage four dwarf chilli bushes in each one! After pre-soaking with pH-adjusted water, I loaded up the slabs with a moderately dilute nutrient solution, cut some holes for the blocks and some drainage slits at the bottom equidistantly between the planting sites. Finally I lay my plants on top. I timed this to perfection, as I had to be out of town for five days; the ideal duration for the plants to initially root into their new slabs. No irrigation necessary. It actually helps to leave them alone. Fortunately I returned to sixteen super healthy looking plants! Next step was to create the tropics in my basement! As such, I decided to keep a twelve hour photoperiod and step up the light intensity to tropical levels! To this end, I combined the spectrums of a 630W ceramic metal halide (basically two 315W lamps housed horizontally in the same fixture) and a 1000W double-ended HPS lamp with a sealed, air-cooled optic chamber. This way convection heat is removed without passing air over the lamp itself. The result was a 2.3 square meter area of such blistering intensity (1000 umol average over the canopy) that I spent the first night worried that perhaps I'd gone too far.

As I already mentioned, chillies are not sensitive to photoperiod. I could've opted for a fraction of the light intensity, spread over more daylight hours, but I really wanted to give my plants an authentic 'tropical experience'. Also, I figured that the intensity would penetrate deeper into the plants. Irrigated by a simple homemade dripper system, one stake per plant, soon all 16 specimens spread out to form a beautiful canopy, guided by some soft-mesh netting. Then, just as I started to worry about the jungle coming back to haunt me, they began to flower! By complete luck it looks like I have judged my plant spacing and numbers perfectly. However, it is still relatively early days. Recently I've created a hanging reflective panel to bounce light back into the growing area and topped up my two reservoirs servicing the four rock wool slabs with 80L of nutrient solution each! This should mean I don't have to perform change-outs so often. Wish me luck! Hopefully by next issue I'll be harvesting the hot stuff!•

RICE FIELDS

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

- Rice is a member of the grass family (Gramineae). There are more than 10,000 species of grass, existing in different habitats. Grass is an important nutrition for both herbivorous animals and humans, for example maize, wheat, barley, oats and sugar.
- Worldwide there are 40,000 varieties of rice, the three major categories are named Indica, Japonica and Javinica.
- Rice thrives best under extremely moist conditions and moderate temperatures. The ideal condition to produce rice is in a humid climate with temperatures around 24°C. Average plant height varies between 1.3 and 16.4 ft.
- In many Asian languages the word for rice is the same as the collective noun for food itself.
- Around the world you'll find different ways to produce rice, with four distinct types of ecosystems: irrigated, flood-prone, rain-fed lowland and upland zones.
- The unique thing about rice is that it can grow in flooded conditions, some species grow in water 16 feet deep. What makes this possible is an efficient air-gathering system consisting of passages in the upper leaves of rice plants that draw in enough oxygen and carbon dioxide to nourish the entire plant.
- It takes 4,900 Litres of water to produce 2 lbs. of rice.
- When rice is not produced with machines, it often takes between 1000 and 2000 man or woman hours to raise a crop on 2.5 acres of land. This makes rice one of the world's most labour intensive foods.
- Besides rice wine, vinegar and beer the distilled plant can produce excellent digestives like grappa and sake.
- There are two Japanese car brands that were named after rice. Honda means 'the main rice field' and Toyota can be translated into 'bountiful rice field'.

What's HAPPENING

A plant that grows tomatoes and potatoes at once, a tree that has forty different fruits, avocado bearing sassafras? Has the world gone mad? No, the world has always been mad. It's just having fun with grafting. And so might you, if you're mad enough.. By Marco Barneveld, www.braindrain.nu

Enter grafting. We know. It sounds mad, but it is not as mad as it sounds. There is no scary genetic modification necessary either. Grafting is a horticultural technique that's defined as attaching a twig (scion) from one tree to the stem of a tree seedling (rootstock). The scion becomes a permanent part of the tree over time. In most cases grafting will work with all plants that are from the same genus. Tomatoes and potatoes are actually related to each other. They are both members of the nightshade family just like sweet and hot peppers, eggplant, tomatillos, tamarios, pepinos, pimentos, paprika, and cayenne peppers. Sassafras and avocado are also related so they can be grafted onto each other.

This is actually a practice that has been used for thousands of years and you may be more familiar with it in terms of apple or other fruit trees. In fact most apple and pear varieties cannot be grown from seed but only through grafting. For example the seed from a Haralson apple will produce an apple tree, but it will not produce a Haralson apple tree. Likewise, the seed from a Honeygold apple will not produce a Honeygold apple tree. In other words, fruit trees cannot be reproduced "true" to the original cultivar from seed, only grafting can reproduce them.

Tree of 40 Fruits

Enter the Tree of 40 Fruits. Created (or better said 'in creation') by the American Syracuse University Professor and artist San Van Aken. He took the whole concept of grafting to the level of grafting galore. His trees will bear forty varieties of stone fruit, including plums, peaches, nectarines, apricots and cherries and he received worldwide attention with the concept. Van Aken has planted 16 trees in seven states across the country. "Each space is unique," Van Aken said about the various art museums, university campuses and private land where the trees are grown.

At its core, this tree is art. Van Aken hopes, as he explains in the video, that people would stumble upon the tree and wonder, "Why are the leaves shaped differently? Why are they different colours?" In the spring, he imagines passers-by would notice blossoms of varying colours, and in summer they would see copious varieties of fruit growing on one tree. However, it's taken on a much bigger role than he anticipated: educating the public about how agricultural practices have changed over the centuries.

Van Aken's project uses more than 250 varieties of stone fruit. Each tree has a different combination of heirloom varieties. It has become a conservation project too, since commercial markets have reduced the diversity of available stone fruits.

The trees grow more diverse in colour and fruit each year. Van Aken typically plants them with twenty of the forty varieties already growing. He returns over several years to prune and graft the rest of the varieties, until it reaches forty. The first tree was planted in 2011 and he expects it to be in full blossom in about three years.

Don't be frightened

Grafting is one of those tasks that can frighten novice gardeners. Like it's something that only experienced gardeners can understand and carry out correctly. Rubbish. You just need some imagination, plants from the same genus, a sharp knife and some grafting clips or see-through tape.

Wait until the weather is warm and there's plenty of sap flow, which means the grafts will take easily. Cut the rootstock seedling flat, and then carefully split the stem vertically. Cut the scion seedling at a sharp angle, and insert it into the slit you made in the rootstock stem. Push the two together, getting as much contact between them as possible. Then hold the graft in place with the grafting clip or tape. Easy as pie. Be patient though. It can take many weeks for the graft to take. You know it has taken when the buds on the scions start to grow. You'll also see callusing around the graft points.

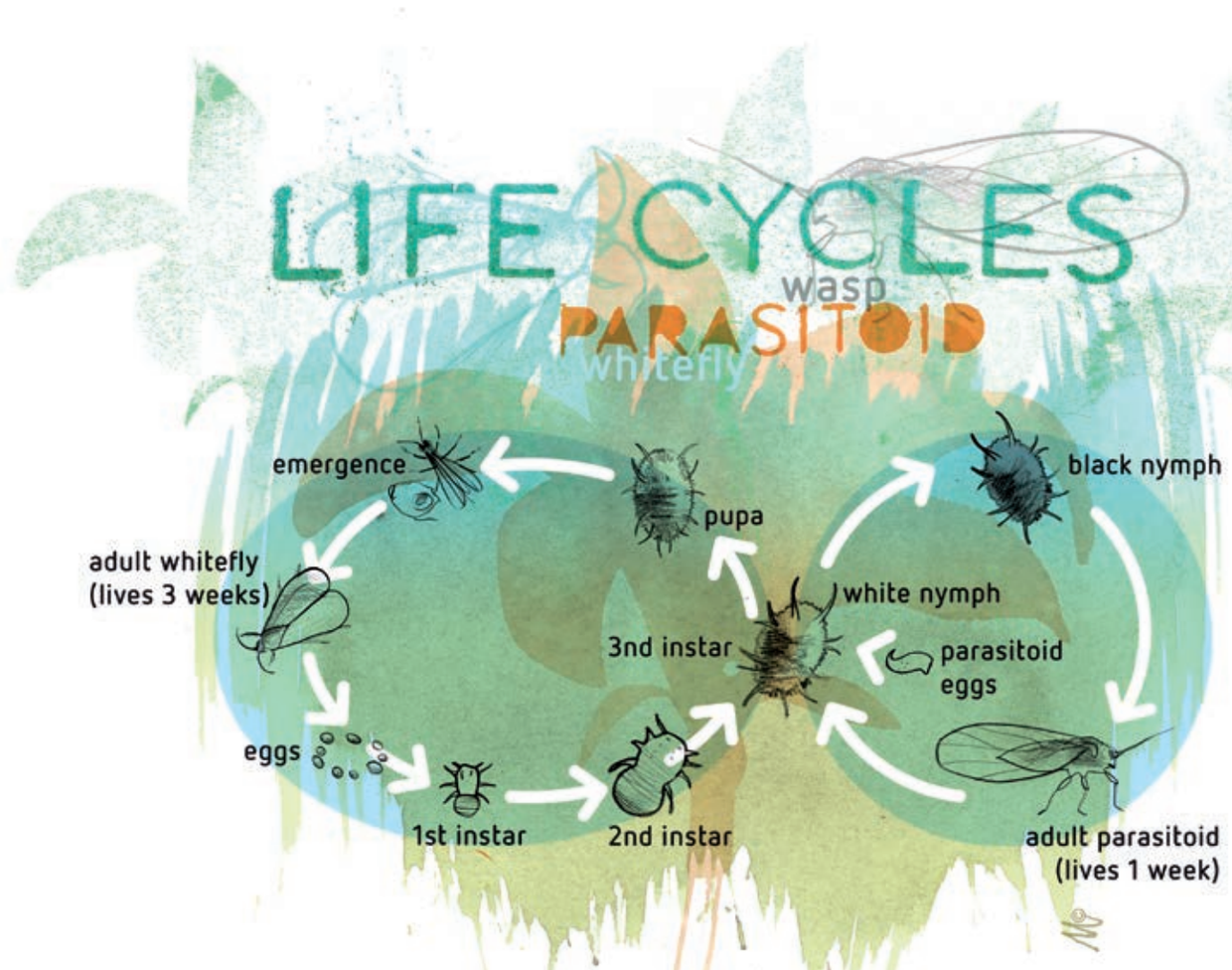
Grafting is great for experimenting and having fun with growing, essentially having fun with Mother Nature. Will you dazzle your friends with a multi-grafted citrus tree full of lemons, limes, tangerines and oranges? Imagine how far you could push the limits? In your small garden, it allows you to grow a number of different tree varieties in the space of one tree.

Or what about The-Giant-Nightshade-Graft-Extravaganza with potatoe, tomatoe, hot peppers, paprika, eggplant and so on hanging from one plant? Start your own art-project, like Sam Van Aken, on your balcony, patch of land or in your greenhouse. There is so much to be discovered and you might just be the one discovering. Are you ready to graft? It's not as mad as it sounds. •

Figure 8: Cherry tree grafting

Pests & DISEASES

In the last CANNAtalk we explained a bit about Integrated Pest Management (IPM). One of the categories within IPM is biological control. In this article we will look a bit deeper into the uses, strengths and weaknesses of biological controls.



BENEFICIALS

Biological control is a component of an integrated pest management strategy. It is defined as the reduction of pest populations by natural enemies and typically involves an active human role. Keep in mind that all insect species are also suppressed by naturally occurring organisms and environmental factors, with no human input. This is frequently referred to as natural control. This guide emphasizes the biological control of insects, but biological control of weeds and plant diseases is also included. Natural enemies of insect pests, also known as biological control agents, include predators, parasites and pathogens. Biological control of weeds includes insects and pathogens. Biological control agents of plant diseases are most often referred to as antagonists.

Predators, such as lady beetles and lacewings, are mainly free-living species that consume a large number of prey during their lifetime. Parasites are species whose immature stage develops on, or within a single insect host, ultimately killing it. Many species of wasps and some flies are parasitic. Pathogens are disease-causing organisms including bacteria, fungi, and viruses. They kill or debilitate their host and are relatively specific to certain insect groups.

Biological control requires a bit of knowledge and common sense from the grower. Introduction of beneficials at the right time is key. The earlier the beneficials are introduced the lower the numbers that are needed and the better the effect. Some beneficials can even be introduced preventatively. It is a good idea to become better acquainted with the biology of the beneficials. Some predators need a specific time, humidity or temperature to establish. They also have different reproductive rates: knowing their lifecycle is important to establish when to introduce into the pest and in what sort of quantities.

Ensure that other natural enemies are not harmed by the application of natural products e.g. plant extracts and minerals. Some of which contain components with a controlling or protecting effect against pests and/or diseases. These may be less selective than is indicated. Of course do not use pesticides, as they will also kill your beneficials.

Advantages of Biological Control:

1. Biological control is a very specific strategy. The vast majority of the time, the predator that is introduced will only control the population of the pest they are meant to target, making it a green alternative to chemical or mechanical control methods. For example, whereas weed-killing chemicals can also destroy fruit-bearing plants, biological control allows the fruit to be left uninterrupted while the weeds are destroyed.
2. Natural enemies introduced to the environment are capable of sustaining themselves; often by reducing whatever pest population they are supposed to manage. This means that after the initial introduction, very little effort is required to keep the system running fluidly. It also means that biological control can be kept in place for a much longer time than other methods of pest control.
3. Biological control can be cost effective in the long run. Although it may cost a bit to introduce a new species to an environment, it's a tactic that only needs to be applied once due to its self-perpetuating nature.
4. Most important of all, it's effective. Whatever pest population you want controlled will no doubt be controlled. As the predator introduced will be naturally inclined to target the pests, very often you'll see the pest population dwindle.

Disadvantages of Biological Control:

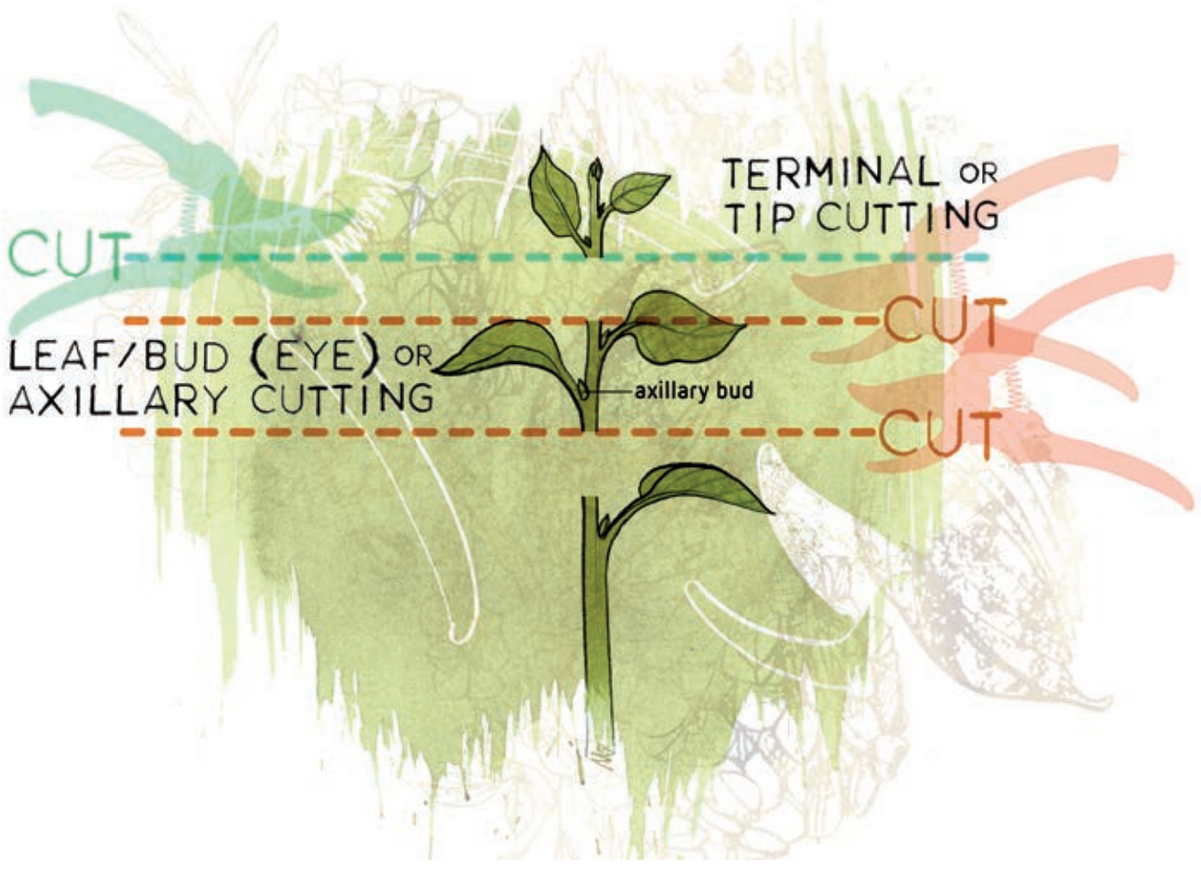
1. It's a slow process. It takes a lot of time and patience for the biological agents to work their magic on a pest population, whereas other methods like pesticides work provide immediate results. The upside to this is the long-term effect biological control provides.
2. If you're looking to completely wipe out a pest, biological control is not the right choice. Predators can only survive if there is something to eat, so destroying their food population would risk their own safety. Therefore, they can only reduce the number of harmful pests.
3. While it is cheap in the long run, the process of actually setting up a biological control system is a costly endeavour. A lot of planning and money goes into developing a successful system.
4. Biological control can be fickle. Ultimately, you can't control whatever natural enemy you set loose in an ecosystem. While it's supposed to manage one pest, there is always the possibility that your predator will switch to a different target - they might decide eating your crops instead of the insects infesting them is a better plan! Not only that, but in introducing a new species to an environment, you run the risk of disrupting the natural food chain.

In the end, it's up to the person with the pest problem to determine whether the advantages of biological control outweigh its disadvantages! •

Figure 9: Caterpillar with eggs

Figure 10: Ermine Moth

THE BASICS OF VEGETATIVE PROPAGATION PART 2



NOW IT IS TIME FOR A SECOND LOOK AT VEGETATIVE PROPAGATION OR THE TAKING OF CUTTINGS FROM A STOCK PLANT TO BE USED AS A START FOR A NEW PLANT. A FEW YEARS AGO, CANNATALK PUBLISHED A PIECE ON THE TAKING OF CUTTINGS, THE HOW AND WHY OF THE PROCESS. IMPORTANT THINGS NEED TO BE KEPT IN THE SPOTLIGHT AND THE PROCESS OF PROPAGATION IS NO EXCEPTION. IT IS THE FIRST STEP IN CROP PRODUCTION. HERE THE ORIGINAL ARTICLE THAT APPEARED IN CANNATALK ISSUE 6 IS PUBLISHED AGAIN IN AN UPDATED AND EXPANDED FORMAT. By Geary Coogler BSc Floriculture / Horticulture

Vegetative Propagation

Nothing could be so simple; take a pair of scissors, cut some tips off a plant, stick them in the ground and away they go, right? Wrong. OK, then take some scissors, cut some tips off a plant, stick them in a new 300 pounds miracle rooting machine and away they go, right? Sorry, wrong again. While the steps are close, there is much more that goes into it before and after to ensure success. An expensive machine is not the answer, doing your homework is.

Stock

To begin, cuttings (not clones which come from a single cell usually from tissue culture) are a reflection of their origin. Just like a newborn baby that is a reflection of its mother's health and genetic strength, **plant cuttings** were a part of the original **stock plant** and as such, shared in the critical balance of light, air, water, and nutrients. If the stock plant was deficient in say Phosphorous, then so too will the cutting be deficient. This problem becomes compounded by the fact that the cutting no longer has legs in order to get to the kitchen for a light dinner or the sink for a drink. The future plant will show a problem rapidly and throughout the cutting's entire development period. It all starts with the stock plant.

The stock plant needs to be actively growing but not pushed, remember we want to force roots after the cut and the cutting does not need to be locked into a vegetative growth surge. Ensure the plant is getting regular feedings but do not overdo. Especially with Nitrogen as this will cause an imbalance in carbohydrate storage resulting in soft cuttings that have little energy for rooting. Overfeeding will reduce the number, size and quality of the root initials. The fertiliser ratios that could be used are as varied as the number of plant species the cuttings can come from so no recommendation will be made other then how the stock plant is growing. If you are working strictly with **terminal cuttings**, you want them to be tight as possible. Avoid too much internode stretch. Cut back on the Nitrogen if this becomes apparent.

You also want to avoid any other nutrient deficiencies. The plant should appear healthy with glossy green leaves and thick cuticles. Keep the light level up during growth periods but try to reduce the amount of umols the plants see by about 1/3 the week before taking your cuttings, but not so low that stretching is induced. Once the cuttings are removed, they will be going into a reduced light environment, which can be as big a shock as losing the roots. Make sure the stock plant has been watered a couple hours prior to cutting. It is also wise to make sure that the stock plant has been in a stable growth routine and not dried down excessively in the previous two weeks. A stable, vigorous, healthy stock plant will yield the same in cuttings. Now that we have assured the stock plant is as healthy as it can be, it must be time to get out the scissors? No.

Taking Cuttings

Taking a cutting requires care, for the cutting not the grower. Choosing the correct tip to keep, where to cut, how to cut, what to use to cut and the how to care after cutting are equally important. Why? Because you want to be successful in making good use of every possible cutting. It keeps down the number of stock plants and reduces the amount of room required for keeping up with production. It also will result in even rooting between cuttings with a lower count of 'blind' cuttings; **blind** cuttings don't readily form roots.

There are four different types of cuttings to consider; Hardwood (deciduous species), Hardwood (narrow leaf evergreen species), Semi-Hardwood, and Softwood (Greenwood) cuttings. There are also many ways to cut and treat cuttings depending on the type it is. These methods are based on the plant type (woody to soft), production time (seasonal changes) and end use. To keep it simple and since it is common to all types of wood (although confined to only spring growth for woody plants), we will discuss the Softwood approach.

The right location to take a cutting lies between too soft and too hard. There is a zone on every terminal that transitions between low carbohydrates/ high Nitrogen and high carbohydrates and low Nitrogen; you want the middle zone. How do you tell? Most of the time experienced growers know this, but new or less experienced growers might want to do the bend test. You take a tip still on the plant and bend it where you want to take the cutting, bend it back double on itself. There are 3 things that could happen: it just bends (high Nitrogen and low carbs), snaps in half or nearly in half (high carbs and low Nitrogen), and one spot that will partially break but not through (just right). Here is the cut zone. This is the section of the stem where roots will most readily form. Now if we only knew where in the internode to cut.

The **internode** is the section of the stem between leaf sets. Some plants form new roots from the node (where the leaves attach), some form them along the internode section. The key is to cut close to the node on those that form at the node and halfway for those that root along the internode. The grower has an option here, to cut it straight or angled. Callus forms faster and seals off the stem quicker on a straight cut. This is a must to keep disease down and get the stem sealed. Cut flowers like roses are best cut on an angle because we need the water to pick up and the wound to stay open to transfer this water. However, some species that are hard to root, form callus quicker if the slant cut is used or if the tissue on the stem is cut along the length of the stem as a small cut. The options are there for the grower to choose what works best for them and the plant. If one way has more issues, try the other. From a commercial point of view, straight cuttings are the norm and allowances are made for the average success rate for the species being propagated. Additional cuttings are taken to cover the loss percentage. Also key is taking care to avoid crushing the tissue at the cut itself. Use a very sharp knife or a set of by-pass pruners (or scissors if they are the only option).

It is near impossible to accomplish this completely, but

THE BASICS OF VEGETATIVE PROPAGATION PART 2

selecting the proper tool can reduce the impact. The cut needs to be clean and crisp. It really depends on the material being cut. **Herbaceous** and very thin **woody** material is best cut with a knife designed for this, it is very sharp and listed as a propagation or budding/grafting knife. The next best option is a bypass pruner. This has one blade and one arm that catches the work so it is still a cut but has more pinch then a knife. Scissors, anvil pruners, and fingers should be avoided and used only where cutting is done for pruning purposes and not for taking a viable cutting. They crush the stem. Remember we want a nice, clean cut.

Rooting

Next is dealing with the cutting from cut to plant (stick). All cuttings need to go directly to 100% humidity when cut. The longer the interval of dryness, the worse the cuttings will do. If you have to work large areas, use wet cheesecloth or burlap to wrap the cuttings in. Keep them dark, cool and moist. Is there an advantage in allowing the cuts to dry some before sticking them in medium? Yes and no: herbaceous cuttings do not show any marked differences in results as woody plants but they do rot less frequently. Then again, they also root faster because the lack of lignin in the stem of herbaceous cuttings allows for faster rooting. It is for this reason that these types of cuttings are not allowed time to dry off. Work them soon as possible to keep the auxins flowing down the stem since they need to work at the bottom. A word of caution here: if the grower uses a rooting chamber that sprays a mist up onto the stems of a cutting, and provides no top humidity control, perhaps they would be better off cutting them on a slant to allow for water penetration since these units depend on this route to supply the water demands of a cutting.

Acceptable media for rooting has to be or should be close to the medium that will be used for growing them on: use inorganic for those systems that are inorganic and organic with organic systems. You have to match the properties. Plants develop new roots with characteristics suited for the medium and the subsequent job they must do. If you are growing in soil or soilless mix, it makes little sense to put roots on a cutting by using a water based rooting system; the plant then has to devote time and energy to convert those roots to ones that will work in the new environment, where water and minerals are more scarce. If you intend to grow on in clay pebbles, then root in something like water, rock wool, or floral blocks. This will insure root compatibility from the start. Avoid sticking the cuttings too deep. While Tomatoes can handle being transplanted deeper, most things cannot. On plants that root at the node, you need to just bury the node. On the others, leave the node above the medium. Finally, make sure you water in the cuttings when done. This ensures a seal on the stem and settles the cutting into place.

Now what do we do? Let's see, we fed the stock plant, took the cuttings, stuck the cuttings. So now we get it under 100% humidity. This can be done with anything from a dome to a misting system. Some plants are not particular and will take it drier (others much drier) but if the plant is not a cactus, or succulent, then it will probably benefit from this approach. Humidity reduces the water use and supplies water to the cutting, keeping the leaves turgid, the systems functioning, and the other processes processing. Keeping the lights at a lower intensity will enhance rooting while decreasing leaf functions to survival levels. It will slow transpiration while necessary components are utilised at the root sites to build a new root structure. Keep the atmosphere around the cutting warm (not hot), keep the humidity up (100%), and keep the root zone temperature warm as well about 25° C. Hold this humidity till root initials and/ or callus tissue is seen, then you can allow some time below 100% but above 80% to encourage root growth. When roots are seen in the surrounding medium, it is time to get them to 80% humidity and refrain from spraying water on the leaves in order to limit disease issues. When the roots hit the outside of the root cube, pot or whatever, transplant them.

Transplanting

The timing here is important. If a grower waits till they have a root ball formed, the roots are old, 'pot-tight', and prone to growing on with less branching. Don't wait! The roots need some size but not a mass. Hold off on stimulants until the cuttings are transplanted unless they are rooting into medium then use them soon as roots are noticed (some stimulants can be supplied through the leaf earlier), although rooting hormones are used before sticking a cutting into the rooting media. Following the earlier advice on allowing the new cuttings' fresh wounds to dry some before sticking will do almost as well as fungicidal powders. The grower should never transplant fresh rooted cuttings into too large a container, use an intermediate size. For example, do not transplant a 1-inch cube with rooted cutting into a 20 L container; use an intermediate size like a 4 inch for root formation. The plant won't care and it will be less likely that this one gets over-watered.

A critical point to make at this juncture: roots require 100% humidity to avoid damage. The longer the tips are exposed to air, the greater the damage that is done. Keep the time it takes, from pulling plugs and exposing the roots to the air, until they are buried in their new home, to a minimum. Do not harvest hundreds of plugs in the morning then wait till the afternoon to plant them. Harvest, or remove from the starter trays exposing the roots, only what can be done in 15 minutes. Once planted, ALWAYS water them in with suitable feed levels for the medium, adjusted to the bare minimum needed.

A cutting that is being transplanted the first time does not need to be jammed into a container that has an ocean of media. A cutting that is 4 inches tall should not be put into a 20 Litre container right away. Drop it into smaller container first and allow it to gain root volume, then move it up. For the next potting stage, the same rules apply: Once the roots have made it to the outside of the root ball in good numbers, but loose, move it up. This will keep water constant, avoid over-watering, insure adequate nutrient availability and make cropping easier. Keep the mediums in the smaller container the same as the final home.

Care of the Transplants

The application of fertiliser is dependent on the medium for both timing and amount. If fertiliser is applied to a medium like soil or peat, then a fair amount will stick to the particles either directly or through bind sites. If there is not enough plant to use these nutrients, then they stay

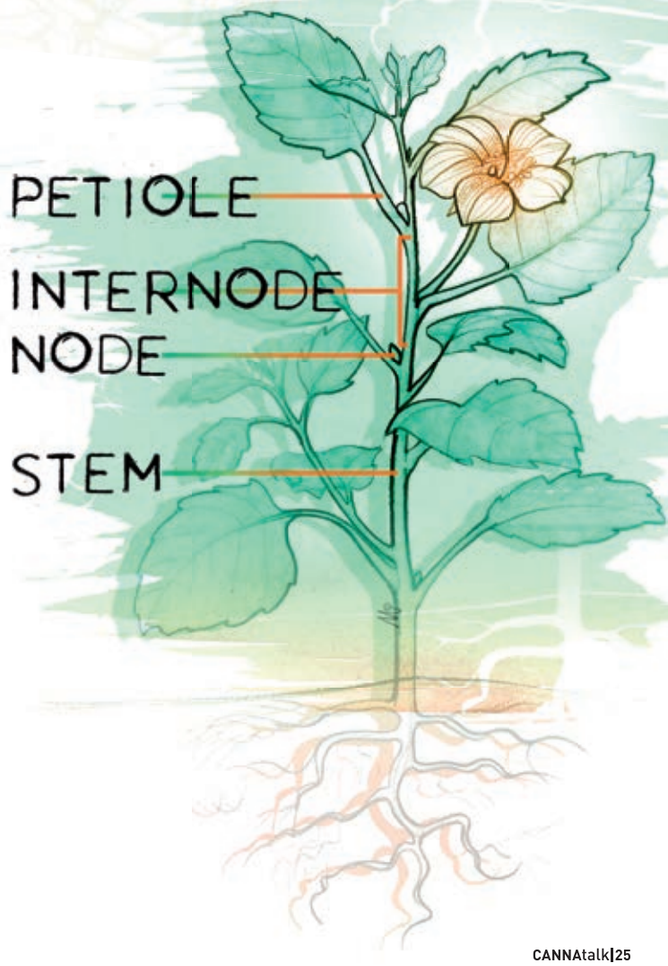


Figure 11:
Cuttingsplit: Taking Cuttings:
2 cuttings from a single tip

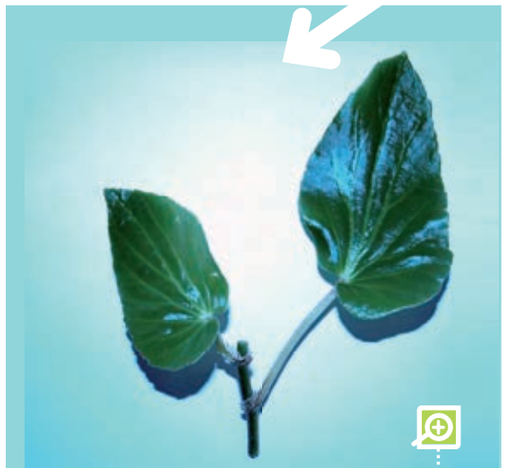


Figure 12: Cuttingleafeye: Type Cutting:
The Leaf-Eye cutting with no tip and 2 axillary buds

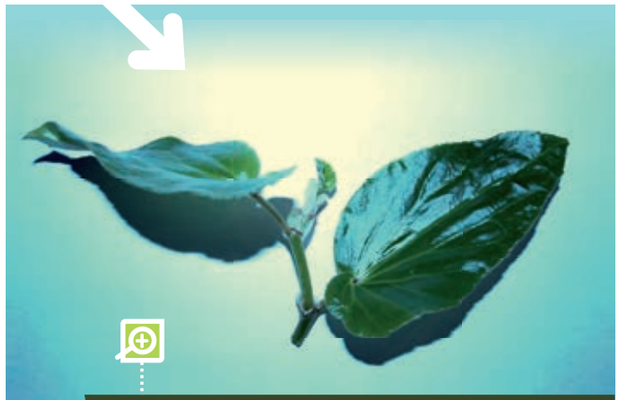


Figure 13: Cuttingtip: Type Cutting: The tip cutting

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around and add to what ever is applied next, ultimately leading to high salt issues. So, feed new cuttings and plants lightly and increase in proportion with the roots.
Foliar feeds can be applied to leaf surfaces but in light amounts. Nitrogen does have a tendency to leach out of leaves under a mist system as well as some other elements. Usually, little foliar feeding is recommended where roots form in less then five days. What had been accumulated in the terminal during its time as a stock plant should suffice. There is little advantage to it beyond this interval. The root system is, after all, the best way to introduce materials to the plant. This holds true throughout the plants life, feeding is best done through the roots. If a plant has problems, and foliar applications are required, there is a problem elsewhere that should be fixed.
Taking cuttings is easy, especially with the right plant. Some plants don't cut well at all. Some take weeks to put on new roots. Some are starting new roots while still on the stock plant. The grower has to know what is possible with the plant/crop they have chosen in order to know what to expect.

Is it always wise to use rooting powders to get 12 hours worth of faster rooting, or does it cost more then the benefit? If a crop can typically be anticipated to throw 10% blind or deformed cuttings, should a grower take 10% more cuttings then needed to cover this? Yes. A grower has to work with the averages to win, or change his/her course of action. Remember, cutting anything alive has consequences, to the cutting and stock subject. If you take care of the stock and the cuttings, you will succeed time after time.
For some additional hands-on tips make sure to also read the Grower's Tip **on page 27**. •

Grower's TIP #33

By your friend SEZ

CUTTINGS

Taking cuttings is easy, making them grow roots... Sometimes a bit less. In most cases, lower than expected success rates are caused by the grower over complicating things or making basic and avoidable mistakes. If you look closely at the few following tips, then like many others, you should also enjoy 90%+ success rate!

Firstly, cuttings are a photocopy of the original, so make sure it looks good before copying it. It is crucial that the stock plant is very healthy before taking any cuttings. Ensure it has been well watered and that there are no signs of pests or disease. A few days before taking cuttings, it is a good idea to apply CANNA RHIZOTONIC to the stock plants both as a root drench and as a foliar spray. This helps make the plant healthier and more stress resistant. Definitely a good thing for both the stock plant and the cuttings, as the process of taking cuttings is no doubt a big shock.

Secondly, because rooting will occur in a warm and very damp environment (24°C /90-99%Relative Humidity), make sure everything involved is very clean. This means the trays, domes, tools used to take the cuttings and your hands. Remember, while cuttings perform better when it is warm and moist, so do fungi and bacteria.

Without going into the "gel or powder" debate, you should know that like most hormones, the exact levels need be very precise to get the desired effect. This is why you can find different rooting products with different concentrations of active ingredients (usually I.B.A.) as they are meant for different type of stems: soft or hard wood.
Using the hardwood version on soft tissue will not make it root faster. On the contrary, it may inhibit rooting for a long while. Then you need to keep in mind that both gels and powders, because of what they are made of, have a slight desiccating effect. If you apply too much it will dehydrate the epidermis of the cutting and it's surroundings, which may kill the cuttings before they strike a new root. Follow instructions on the product and remember that when they say "remove excess", they mean it.

Another common source of failure is grower's impatience. Once cut from the mother plant, the cutting is obviously no longer replenished with moisture from the roots, therefore you will need to keep leaf transpiration to a minimum. This is done by keeping the area around the leaf very humid. This is why many chose to use a propagator (tray and clear dome) as it's easier than keeping the whole room above 90% RH. Avoid taking off the humidity dome! Each time it is removed it causes a brief drop in humidity and the leaves will "let go" of some water, eventually leading to levels being too low for them to survive. The cuttings are in some kind of suspended animation, so until they get the first root out it is way better to leave them quietly alone.

There are some thermo/hygrometers that are designed to be installed on the dome itself to show you exactly what is going on inside, and help you keep levels where they need to be. They are great, but there are also some ways to approximately figure out the relative humidity (RH) levels, for free. This is done by looking at the condensation level on the dome. While being very approximate, it will give you an idea of what is going on inside. If the condensation line is halfway, you likely have around 50% RH If you have water droplet on the top part you are likely over 100%, which is a bit too much. On the other hand if you see no condensation at all, you should promptly increase the humidity within, as the RH is likely to be under 50%. A fine mist of RHIZOTONIC solution (2ml/L) will bring levels back up quickly while providing vitamins and some rooting aids to the fragile cuttings. Again, less is better; a fine mist does a better job than an intense soaking. Remember the goal is only to make the humidity higher.

Once rooted, after a few days, slowly acclimatise them to normal humidity levels. By gradually opening the vents on top of the dome and making gradually larger gaps between the tray and the dome, a gently increasing amount of airflow is created in order to ease them into their new environment. Some growers use a pen as a spacer to achieve this. Pay attention!! If you see the cuttings begin to wilt, promptly mist them and re-seal the dome and try again the next day.

Once the cuttings have rooted, they will require feeding. Time to use CANNA Start!

Good luck and Happy Gardening
Your friend Sez!!! •

Puzzle&WIN

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

WIN A 1 LITRE BOTTLE OF CANNABOOST

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

PRIZES

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

A BOTTLE OF CANNABOOST COULD BE COMING YOUR WAY.

Winner puzzle#31

The winner of last Sudoku is **Paul Lloyd.** Congrats on your 1 litre bottle of CANNA RHIZOTONIC.! We will contact you as soon as possible to make sure you receive your prize. Enjoy!

WHAT'S NEXT

Pardon me? You just read through an entire issue of CANNAtalk and rather than being pleasantly satisfied the first thing you do is ask for more? Well, we can hardly blame you to be honest. We are already looking forward to the next issue as well. What is it going to be about? Well, we will be shedding some light on one of our favourite products: Enzymes. People use them all the time; life simply couldn't exist without them. So what exactly are they? Why is it that using enzymes can be so beneficial to your plants? Join us next issue to find out!

DON'T MISS IT

CANNAtalk is a magazine, YOUR VOTE COUNTS!

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

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

Request information

- ☐ AQUA Fertilisers (Recirculating systems)
- ☐ HYDRO Fertilisers (Run to waste systems)
- ☐ COCO Fertilisers (Coco Coir)
- ☐ TERRA Fertilisers (potting mix)
- ☐ Additives (Optimizing your yields)
- ☐ List of shops in my area
- ☐ Send me a CANNA Calendar 2016. I've secretly enclosed 10 pounds in this envelope to pay for it.

Solution to the puzzle:

#33

CANNAtalk

SERIOUS GROWERS

CANNAtalk:

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CANNAtalk doesn't just write about nature, it is also committed to preserving our natural environment. Did you know, for example, that this paper comes from sustainably managed forests?

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