

CANNAtalk[®]

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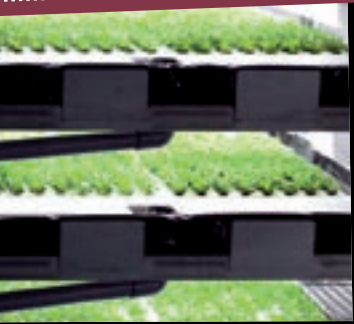
NUTS ABOUT COIR?

All you need to know



ROBOT FARMERS

The future is now



FIELD PEAS

A poor man's meat?



Powered by

CANNA

The solution for growth and bloom

And more:

Don & Nicky

Factographic

Pests & Diseases

Puzzle & Win

Grower's Tip

Questions & Answers

GARDEN CONTROLS

New Series By



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HOTalk:

When I was a teenager I once spent a long, hot summer at the sunny beaches of the Costa Brava in the north of Spain. I met this lovely Spanish girl named Silvia and I was love struck. It took a bit of effort and patience but I got my very first kiss that vacation. Point is, she wore this sunscreen that smelled all coconutty. Ever since, when I smell that sweet fragrance of coconut oil I take a trip down memory lane into a time of youth, joy, discoveries and good times.

Aaah, the good old coconut. In this issue of CANNAtalk there is a lot to read about the humble coconut. You will be surprised to see what an intense and timely process it is to produce a growing medium out of this nut. If it is done correctly, that is.








But there is something comforting in time and labor consuming processes as well, especially in a world where we are on the verge of robots taking over large scale farming and gardening. Although it is fascinating to read where science is taking us in order to keep feeding the ever growing population of this planet. Read all about it on page 18.

In this issue we will also share a bit about growing your own field peas. They are easy to grow and extremely nutritious. We'll even throw in a recipe that once fed the whole Dutch navy in the time they ruled the seven seas.

So enjoy reading. And if you happen to be on a beach with palm trees, watch out for falling coconuts, sometimes dubbed the killer fruit. Nah, don't worry. It's just an urban myth.

Cheers,
Jeroen

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PRODUCING COIR TAKING THE PITH

CONSIDERING THE EXTENT THAT COIR HAS NOW TAKEN OVER THE HYDROPONIC INDUSTRY, AGRICULTURAL CROP PRODUCTION USING COIR AS A SUBSTRATE GOT OFF TO A BIT OF A ROCKY START. FROM MARCO POLO FIRST DOCUMENTING THE EXTRACTION OF THE FIBERS WAY BACK IN THE 13TH CENTURY TO THE SECRETARY OF THE ROYAL HORTICULTURAL SOCIETY, JOHN LINDELEY, UNSUCCESSFULLY INTRODUCING THE SUBSTRATE TO THE ENGLISH GROWING COMMUNITY IN 1862, IT WASN'T UNTIL LATE IN THE 20TH CENTURY THAT IT ACTUALLY BECAME A SERIOUS AND VIABLE ALTERNATIVE TO COMMON GARDENING PRACTICES.

By NICO HILL

Although it was recognized that the humble coconut could indeed be a fantastic base on which to grow a plant from quite a long time ago, the main thing that stifled its rise to the agricultural hall of fame was not correctly understanding or being able to correctly analyze it. Fortunately for you modern day growers, analytical techniques and production methods have come some way since the 1800's. Coir and its production for horticultural practices is now firmly here to stay.

The Basics

So we should probably start at the very beginning of the story, along a picturesque shorelines of the Indian Ocean. The palms that grace the shoreline aren't just there to give holiday makers some shade in which they can sip their cocktails without their pastey white skin being burnt to a crisp, they are also growing something exceptionally versatile: A coconut.

The coconut is the basis of countless types of products: Activated carbon, floor mats, body creams, oils or health drinks. This list could quite literally go on for probably this entire page. It would seem that mankind has managed to craft quite an industry from the humble coconut. A lot of these products are all crafted from the fleshy pulpy bit inside the shell. Everyone is familiar with this part of the

coconut, the Copra. What may be slightly less familiar to most people is the bit outside this shell: the husk.

In the diagram (see figure 3) you see a cross section of a coconut. Starting from the inside out there is the copra (the bit you can eat), then the shell (the hard bit that annoys you when you want to just start eating), the husk (the important bit for us gardeners!) and then the outer skin. The husk used to be a waste by product. Once the copra had been extracted, that was as far as the interest in the nut went. The remains were then swept aside without even a second thought to what should be done with it all, other than where to throw it away.

Some clever souls then realized that all this waste may actually have some value after all. Rather than just chuck all of this material away, it was discovered that with the correct production processes in place, it could be nice and neatly converted into a product that plants could thrive in and generate yet another revenue stream from the golden goose of the nut world.

How it is made

You can't just crack open some nuts, eat the copra then stick the remains in a pot with a plant and start watering. Unfortunately it's not that simple. The husk needs to go



Figure 1 : Too many things can negatively influence a production run. Ideally you want it to run like a well oiled machine.



PRODUCING COIR TAKING THE PITH

through a few stages before you can even get close to potting a plant in it. The first stage of the process is called 'Retting'. It involves a nice long soak in water in order to soften up the fibres enough to make them suitable for use. This soaking does not happen overnight. It takes an immensely long time before the husks are suitable for use. Typically, a period of twelve months will be required for soaking to ensure the fibres have the correct physical properties for use. After this soak, the vast majority of the fibres are gathered up and used in the textiles industry, to make bags, mats, brushes, ropes and a myriad of other products.

The remaining pith, fibres and chips then need to undergo yet another aging process. This time they are simply left in piles and allowed to decompose to a certain degree. If this decomposition process was not performed, then the coir may well end up drawing away too much nitrogen from the nutrient solution if it were to be used for a media at that point. Not only does this aging process prevent any unwanted conflict with nitrogen down the line, it also allows for the proliferation of naturally occurring bacteria and fungi in the coir itself. In particular, Trichoderma. Trichoderma fungi play an important part of one of the natural benefits of coir, however for some companies this

benefit is lost completely during the production process, in particular, to gain the RHP certification. This quality standard set for substrates deems they must be free from weeds and pathogenic organisms. Rather than having complete control over the entire production process (which is an incredibly involved and complicated venture to undertake) a lot of facilities will go for the quick and easy option of steam treatment. Whilst this does kill off harmful bacteria and fungi, it also kills off the beneficial ones like Trichoderma.

So finally now we can grow in it right? Wrong!

So after this extensive period of time that the coir has been soaked and aged, surprisingly, it still isn't quite yet of the quality needed for horticultural practices. Coming from a highly salty seaside environment, a large amount of salts (mainly sodium chloride) will still be needed to be removed to make a suitable environment for root growth. In a nutshell (haha) clean water is slowly passed through the coir to wash these salts away. Once enough water passed through the coir to reduce the salt levels to an acceptable level the next step of the process can then begin: putting some salts back in.

Granted, that does sound quite strange but it is actually quite a significant and arguably the most important step in making coir suitable for horticultural usage. The reason this step is so important is it all boils down to the fundamental properties of how coco reacts in the presence of different elements, or ions. In particular calcium cations. It is referred to as buffering, but don't think of pH buffering as you may do with conventional potting mixes.

Calcium Buffering

Coir loves calcium. It will try to both take and hold onto this element preferentially over almost everything else. In doing so it replaces what it has taken with another type of element, usually potassium. This is highly significant for plant growth as calcium is a hugely important element for correct plant growth. One of the most common nutrient deficiencies seen by growers worldwide is that of calcium. You don't want to compound issues affecting calcium uptake from a poor environment, by not having enough available calcium in your substrate.

Calcium nitrate is usually the first choice when it comes to buffering the coir. This is dissolved and applied in an aqueous solution through the media so the calcium will displace more unwanted sodium ions and at the same time some potassium ones. After being buffered with calcium the coir becomes a product that is much more suited for agricultural practices.

Double buffering

After being washed and buffered, the coir is entirely suitable for growing plants in. However to achieve the most optimal and premium quality of coir the process is then repeated for a second time. The second washing will displace even more sodium and potassium salts, but also a few calcium ones too. After this washing the sodium levels are extremely low, so it is just the case of passing a calcium rich solution through the media once again. The result is a coir with super low sodium levels and amazingly high calcium levels, altogether making the ideal grade of coir for plant growth.

Transportation

There are a few points along this process where it can be transported from its homeland in India, to us consumers



Figure 2: Remains of coconut husks enjoying a long soak before the rest of the production process.

over in the west. Either after the first wash (so no calcium buffering), after the first wash and buffering or after the second washing and buffering. Commonly to make transport a lot simpler, the coir is dried and compressed into blocks and then slowly re-hydrated and bagged when it gets to its destination. Transportation in this way is much more ecologically sound rather than in heavy and bulky 50L bags as you see them on your shop shelves. So although conventionally it is assumed that compressed blocks of coir are of a poor quality in terms of salt and calcium levels, it simply depends on which type and how far down the washing and buffering process a company chooses to go. Obviously the more time and resource you spend on washing and buffering coir, the more expensive the overall cost becomes.

Influences on production

There are all sorts of things that can influence a continually high grade supply of coir. Firstly, inadequate financing is a common problem in holding things up. Large amounts of funds are locked up in raw materials for a significant time in coir production. If at any time funds aren't available to purchase the correct resource, this will



PRODUCING COIR TAKING THE PITH

cause issues on a continual supply down the line. Secondly a shortage of skilled and trained workers can often be an issue. Significant investments must be put in place to get the correct skills in a workforce, and to maintain a low level of worker attrition. Inadequate supplies of husks, machinery maintenance costs, erratic power supplies and last but by no means least the weather (eg: problems with drying fibers during the rainy season) all contribute to effecting a continual supply of quality coir. If, as a manufacturer, you do not have complete control over the production facility and are essentially purchasing and repackaging off of a third party coir producer you have managed to source, then you can and will be subject

to the above problems that face coir production. Having ownership over the total production site and process allows you to mitigate against these problems so your production of high grade coir is not compromised by either global or localized issues. This practice allows for a consistently high grade and high turnover of production, giving you a clear edge and advantage over others who have not made the significant investments required to do the same.

In a nutshell

So hopefully now you should have a good idea of all the time and effort that goes into producing a high quality coir product. As you can see it is by no means a quick and easy process, so that is something that you will see manifest itself in the different qualities of coir available on the market. While they all may well look very similar, that is most likely where the similarities will end. Always ensure you have chosen a reputable brand, and you are not being duped into purchasing sub standard quality coir. You may not be able to see the difference, but your plants definitely will! •

CROSS SECTION

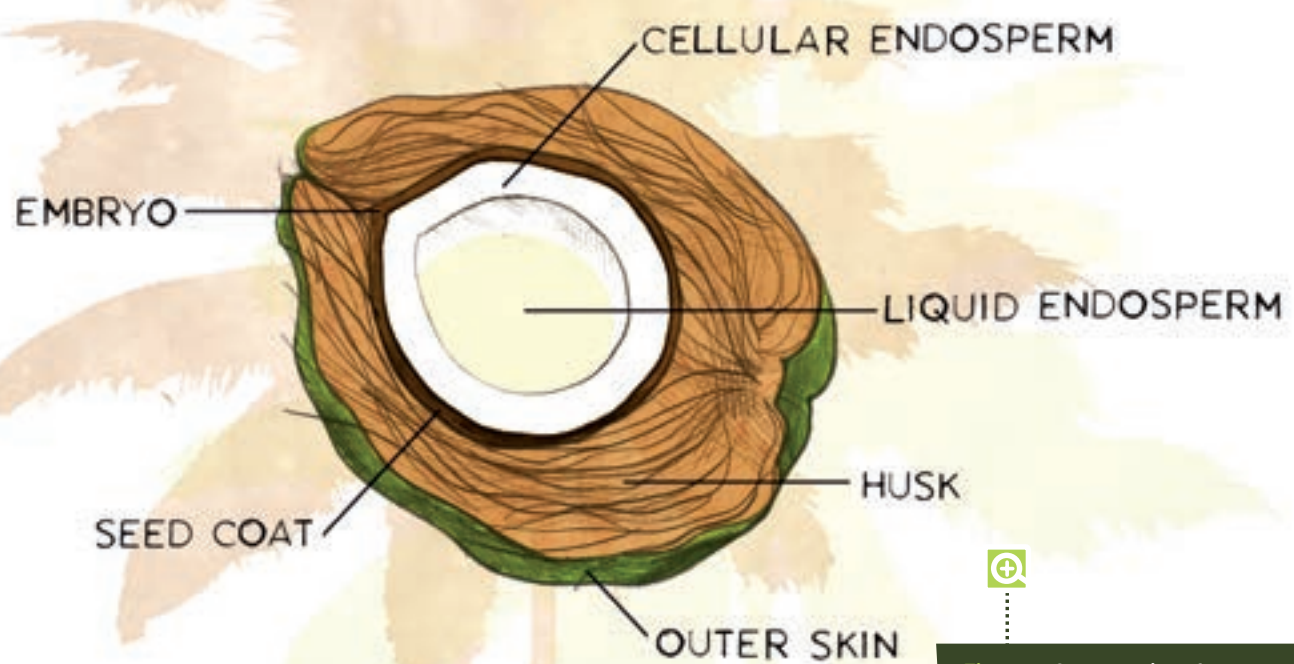


Figure 3: Cross section of a coconut. The bit you find in a supermarket is actually the small inner part of a much larger fruit body.

GrowIT YOURSELF



THE MYSTERIOUS FIELDPEA:

MR INCOGNITO

HE GOES BY MANY NAMES AND HAS FILLED UP MANY A SOLDIER'S BELLY. KNOWN TO STINK UP THE WORLD TRANSFORMED INTO FARTS WHEN LEAVING THE BODIES THAT ATE HIM. SOMETIMES CONDESCENDINGLY CALLED 'POOR MAN'S MEAT' BUT EASY TO GROW AND VERY NUTRITIOUS. MAY WE INTRODUCE YOU TO MR INCOGNITO AKA FIELD PEA AKA BLUE POD CAPUCIJNER AKA DUN PEA AKA...? By Marco Barneveld, www.braindrain.nu

It's a mysterious one this one. When you see it dried up, you might think of it as a bean instead of a pea. It's all part of its scheme to confuse the world. Tricking people in being different veggies at the same time. That's why it goes by

many names as well. Why Field pea does this no one knows. It might have something to do with the fact it used to hang around soldiers a lot and does not want to tell the secrets it hears. Sometimes named Capucijner pea, after the Capuchin



MR INC○GNIT○

monks that wore a grey-brown coat just like the Capucijner pea, it is delicious and nutritious whatever name it takes on. Humans have loved it for millennia. Seeds showing domesticated characteristics dating from at least 7000 years ago have been found in archaeological sites around what is now the Middle East. Supposedly, the Romans used ground up Field peas to create some sort of hamburger. This being a poor man's snack it might have been the beginning of its nickname poor man's meat.

In the traditional southern USA New Years recipe Hoppin' John (Field peas with onion and bacon) each Field pea represents a coin. The peas are symbolic of pennies, or coins, and a coin is sometimes added to the pot or left under the dinner bowls. One common tradition is that each person at the meal should leave three peas on their plate to ensure that the New Year will be filled with luck, fortune and romance. Another tradition holds that counting the number of peas in a serving predicts the amount of luck (or wealth) that the diner will have in the coming year.

Healthy bugger

Well, if you have little money then eating Mr Incognito makes sense, since they are crammed with goodness. Are you ready to hear some of its health benefits? Here we go!

Field peas are one of the most nutritious leguminous vegetables rich in health boosting phytonutrients, minerals, vitamins and anti-oxidants. Fresh, tender peas are relatively low in calories compared to bean, and cowpeas. 100g of Field peas carry just 81 calories and no cholesterol. Nonetheless they are good sources of

protein, vitamins and soluble as well as insoluble fibre. Fresh pea pods are excellent sources of folic acid. 100g provides 65µg or 16% of recommended daily levels of foliate. Foliates are one of the B-complex vitamins required for DNA synthesis inside our cells. Studies suggest that adequate foliate rich foods when given to expectant mothers would help prevent neural tube defects in their newborn babies.

Fresh Field peas are very high in vitamin C. 100g of fresh pods carry 40 mg or 67% of daily requirement of vitamin C. Vitamin C is a powerful natural water-soluble anti-oxidant. Vegetables rich in this vitamin will help the human body develop resistance against infectious agents and scavenge harmful, pro-inflammatory free radicals from the body. Garden peas are also good for vitamin K. 100 g of fresh seeds contain about 24.8 µg or about 21% of daily requirement of vitamin K. Fresh Field peas also carry adequate amounts of anti-oxidants flavonoids such as carotenes as well as vitamin-A (providing 765 IU or 25.5% of RDA per 100g). Vitamin A is an essential nutrient required for maintaining healthy membranes, skin and eyesight. Additionally, consumption of natural fruits or vegetables rich in flavonoids helps to protect from lung and oral cavity cancers. Furthermore, they are rich source of many minerals such as calcium, iron, copper, zinc and manganese.

Oh, and they taste great too. Especially fresh from the vine when they are the most sweet and soft. Are you convinced yet to fill that small patch of leftover garden with Mr Incognito? I bet you are.

Grow it yourself

Field pea is an annual that will not tolerate frost. Sow Field peas in the garden four weeks after the last average frost date in spring. For an early start, sow Field peas indoors six weeks before you plan to transplant them into the garden. Sow successive crops every two weeks. Field peas require 60 to 90 days to reach harvest. Plant 30 Field pea plants for each household member.

Plant Field peas in full sun, though they will tolerate partial shade. Grow Field peas in loose, well-drained soil. Field peas prefer sandy, loamy soil. Soils rich in organic matter will increase productivity but Field peas, like other legumes, are often planted to help improve poor soil. Add aged compost to growing beds at planting time. Field peas prefer a soil pH of 6.0 to 6.5.

Planting and spacing

Sow Field peas one inch deep, space plants two inches apart later thinning successful seedlings to two inches apart. Space your rows three feet apart. Field peas grow best in well-warmed soil. Grow Field peas up stakes, trellises, or wire supports strung between stakes.

Keep the soil moist; do not let Field peas dry out. Water at the base of plants as overhead watering may cause flowers or small pods to fall off and reduce the yield. Add aged compost to growing beds at planting time. Side dress Field peas with compost tea at midseason. Too much nitrogen will prevent blossoms from setting pods. Do not plant Field peas with garlic, onions or potatoes.

Field peas can be grown in containers, but growing peas in container may not be practical because many plants are required to produce a reasonable crop.

Pests & Diseases

Bean beetles, aphids, spider mites, and leafhoppers can attack Field peas. Control aphids and beetles by hand picking or hosing them off plants or pinch out aphid infested vegetation. Plants infested with spider mites should be removed, placed in a paper bag and then put in the garbage before they spread to other plants.

Field peas are susceptible to anthracnose, rust, mildews, mosaic and wilt. Keep the garden clean and free of debris. Do not work with plants when they are wet to avoid spreading fungal spores. Remove and destroy diseased plants before healthy plants are infected.

The mature pods of the Field pea are exactly like leather. Pick the pods before they turn to that state and eat the peas fresh. If the pods have matured so far that they become mealy instead of sugary, let them run to dry peas. They make excellent porridge in that state

Eat it yourself

In the Netherlands, Field soldiers who were served Field pea in their rations called peas raasdonders. They made it into a great dish called Raasdonders met Spek, or Field beans with bacon. Easy to make and you can win a war after eating it. Try it. Here's how you make it for about four people.♦

R E C I P E



FIELD BEANS WITH BACON

What You need:

- 2.25 pounds of fresh Field peas
- Dash of salt
- A bit of olive oil
- Three onions
- 1.1 pounds of bacon
- British style yellow piccalilli, or alternatively neon relish

Do it like this:

Use 2.25 pounds of fresh Field peas, add water until the peas float and add a dash of salt. Bring to a very short boil of about five minutes. Cut three onions and fry in a pan with the oil until golden brown. Take out of the pan. Cut the bacon in small pieces and fry until crispy in the oil of the onions. Take a plate. Put the peas in. Cover with onions and bacon. Put relish on the side. Yummmm.

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.cannagardening.com, to submit your question.

Question

I have a 24 bucket Undercurrent System. Normally I change my nutrients out every 3 weeks. Looking at your recommendations you choose weekly change out. I'm most concerned about the CANNA RHIZOTONIC and CANNAZYM. How long are they effective for? Is it 1,2 or 3 weeks? Do you have to add back a portion or are your products put them in once and you are good? The system maker promotes using 1/2 strength nutrients, what are your best use practices?
Thank You, Steve R

Answer

Hello Steve, Thanks for the question. I see you only really ask one specific question here so I will answer that one first then venture some opinions for you as well. To start, nothing lasts forever if it is a plant nutrient intended for being taken up, in solution. There is a 5 - 7 day maximum before the majority of usable nutritive ions in any product added are taken up and replaced by waste products and protons given off by the plant which serves to keep the EC (TDS/ ppm in your case) elevated wrongly giving the impression all is where it should be. The reality is that the level of actual nutritive ions is very low and the ratio required is no longer correct. CANNA RHIZOTONIC and CANNAZYM work within this time frame, after that, no. I am sure some remains but not enough to matter.

The system maker simply supports the general horticultural knowledge that when constant feeding (nutrients always available in the solution) it must be at the correct range a plant normally sees in the native soils it evolved in, usually around an EC of 1.0 mS/cm. They also recommend a 1/2 rate approach with all the heavy mineral fertilizers to keep all the reactions I am about to discuss at a minimal problem level as well. The concern with the system, like every other DWC system is that you have to diffuse so much air into the water for simple root survival that it affects all the chemistry of the system, especially pH. In the case of your system, the DO or Dissolved Oxygen approaches what is required for minimal production in a DWC system of around 12% O₂, (which is 6-8% less than what the plant actually needs or sees in a regular medium) but getting there also dissolves so many other gases and these help drive the pH around. That said, the CANNA AQUA you use has a pH buffer in it, but this reacts with excessive mixing of air (Nitrogen, and CO₂) which is killing your pH as it will always pull pH up instead of keeping it tight around 5.6 - 6.2. This leaves much unavailable such as Nitrogen, many micros like Magnesium, Sulfates, and so on. The results of sitting at a pH of 7.0 is what you are seeing. Adding worm castings, an organic component, to a non-organic system makes the issue worse in ways that are hard to explain.

We do not recommend this system for any new grower, especially a non-commercial application, without that grower having a load of experience. We do have, however, many customers that use this system successfully but they use CANNA SUBSTRA soft water for the base nutrients because it does not have the pH buffer to help pull the pH upward, and they never go more than 7 days between changes of the solution. I hope some of these insights into your system help in your determining which route to take. In growing, as in much of life, the simpler the approach the better the results. Cheers,



What drippers or emitters do you sell or recommend for irrigating buffered

Thanks again for the question. In the buffered coco slab, make

I am switching from soil to coco for my next run. I was wondering do I

Just NEVER put plain water (tap) onto the coco once you plant in it all the

Question

Hello. What drippers or emitters do you sell or recommend for irrigating buffered coco slabs with CANNA Coco A&B nutrient solution? We have tried soaker hose but they clog. Thank you.

Answer

Thanks for the question. In the buffered coco slab, make sure the drains are cut in the bottom of the slab for drainage. Then you can use high volume drippers about 2 per foot is ideal, but I find the shorter directional spray stakes, 2 inch, with a slow feed so you get about a 4 inch circle, enough for about 3 - 4 per slab. If you then apply enough irrigation to get about a 10 - 20% drain, there should be enough solution to reach the outsides easily. After this, allow the slab to lose about half the weight before re-irrigating the same way. This should take under 20 minutes to apply the amount needed and then fully draining. There is sufficient drainage in the medium to not be water saturated after this. Do not overdo the drainage slits, a few is good enough.

Sorry we do not sell any but the lines are all the same, usually, and the stakes/ drippers are available at most good indoor garden stores. Hope this helps,



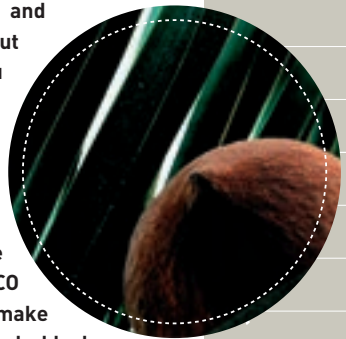
Question

Hello, I am switching from soil to coco for my next run. I was wondering do I need to swell or rinse your bagged coco before use? Thanks. Shap P



Answer

Hello, Thanks for your question.. You do not need to swell CANNA coco, it is loose and in a bag and ready to use. You will need to wet it at planting to drain with the Coco nutrients. Rinsing or leaching out the salts in our coir, is not required. It is pre-rinsed and buffered and ready to use out of the bag. Just NEVER put plain water (tap) onto the coco once you plant in it all the way to the final few days when you flush the plant before harvest to move excess fertilizer out of the plant. Also it's worth noting that we do have a compressed coir product available if space saving is an issue for you. It is the same high quality coir as in our CANNA COCO bags. It even has a unique method to make a consistently uniform expansion of each block incredibly simple. Cheers and Happy Growing,



ATTENTION

Questions



Don & Nicky

(PART 16)

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.

BRINGING THE HEAT WITH THE LATEST GARDENING TECHNIQUES

Don fertilizes his tomatoes rather too efficiently and risks developing a lifelong aversion to them. When I read William Blake's "Proverbs of Hell" one line stood out—in fact, it has remained with me ever since:



"You never know what is enough unless you know what is more than enough."

I should inscribe this quotation on a wooden plaque and install it at the entrance to my outdoor garden. Hopefully these words would serve to temper my future growing efforts because, right now, I can't even bare to look at another tomato. I have munched on so many and not just the same variety: Beefsteak, Roma VF, Queen of Gold (a yellow, medium sized variety I once prized), Marmande

and, last but not least, Baxter's Bush—an overly generous, heirloom determinate cherry.

Yes, you've guessed it—I'm in the midst of a massive tomato glut. Sure, that first Beefsteak was magical—shared with friends and served as a salad with Mozzarella, thinly sliced mild onion, freshly chopped basil and a light vinaigrette dressing with locally produced olive oil. But now I can barely even keep up with the harvest, let alone eating them all! I promised myself this year that I wasn't just going to give most of them away, as community spirited as that sounds. No—growing them is far too much effort to warrant that level of charity. The plan this year is for "selfish preservation". I've made saucepan after saucepan of gloopy "rustic style"



1. Queen of Gold (Reine D'Or) is an extremely productive indeterminate tomato variety that produces truss after truss of delicious yellow fruits.
2. This Beefsteak variety is definitely a favourite. One or two are enough for a family-sized tomato salad.

3. It's best to pick the larger varieties first or you end up with crushed tomato pulp at the bottom of the bag!
4. Hidden treasure. An early truss of ripe Baxter's Bush cherry tomatoes.



5. Roma VF is an excellent variety for making pasta sauces. It's the latest to mature in my garden.



6. Processing and preserving all these tomatoes creates endless washing up.

ketchup—seeds and skins left in, not sieved out—some of them spiced up a little with a cheeky Jamaican chili or two. Delicious! So what's the secret to this year's success? A few things. Firstly, I got serious! I spent a lot of time and money researching and sourcing good quality compost and other organic inputs: bat guano, bone meal, calcium phosphate, seabird guano, blood meal and Azomite, to name just a few. I dug massive holes and filled them with a luxuriously rich potting mix. Secondly, I took care to make sure my plants established themselves properly in the ground and waited until nighttime temperatures were reliably and consistently above 57 °F or higher.

Sometimes I feel like a bit of a cheat for giving my plants a head start in my indoor grow room during the months of March, April and May but it's really no different from going to a nursery. What's more, I claim the satisfaction of starting my plants from seed and having the opportunity to try any variety I wish—not just those on offer at the local garden store. It's funny to see the looks on the old boys' faces when my garden goes from looking brown and barren to being replete with foot tall, chunky tomato beasts overnight. My tomatoes' leaves turned almost bluish from the richness of the soil mixes but after about six weeks I could tell they'd cleared their plates and were hungry for more nutrition. The appetite of healthy, fast-growing tomatoes never fails to astound me. They can take nutrient concentrations that would probably all but kill other, less demanding species. In previous years I've used liquid organic feeds to provide

additional phosphorus and potassium as my plants moved into full generative production but this year I decided to take a different approach and top dress my plants instead. I'd already created slight 'craters' around each planting site—the concave micro-topology around the base of each plant helps to conserve water and promote deeper effective irrigation. This also made it much easier to apply my top dressing. A simple organic potassium input can be provided by powdered kelp meal, or a soluble seaweed extract, or a general PK boost powder blend. Many flowering plants can get hungry for both phosphorus and potassium during mid to late flowering—and a blend ensures these crucial elements are delivered at optimal ratios for uptake.

I mixed my top dressing inputs with plenty of compost—this delivered the goodies with the beneficial biology that's necessary to break them down. I liken liquid organic feeds to a soup starter, and top dressing powdered organic inputs to a Porterhouse steak and fries. The former is an easily digestible "gloop"—great for a quick fix of nutrition. Top dressing, on the other hand, is more like the main course and provides a much longer-lasting boost of fertility. I water in my top dressing with compost tea diluted 50 to 1 with de-chlorinated water. The plant response has been incredible: more trusses, more fruit and more ... errr ... ketchup. I suppose if something's worth doing, it's worth doing well. Next year I will try melons, peppers, egg plants—and okay, maybe one or two tomato plants, rather than fifteen! •



BROOMRAPE DID YOU KNOW THAT...?

- This lovely cistus broomrape might look innocent but broomrape, or Orobanchaceae, is quite a dangerous family and for some plant species as nasty as the name implies.
- Broomrapes are a large family of parasitic plants with about 90 genera and more than 2000 species.
- They are annual or perennial herbs and shrubs, all parasitic on the roots of other plant.
- Orobanchaceae is the largest of the 20-28 dicot families that

- express parasitism. It consists of all types of plant parasitism: facultative parasite, obligate parasite hemi parasites, and holo parasites.
- Most broomrapes lack chlorophyll and therefore cannot perform photosynthesis.
- Parasitic plants are attached to their host by means of haustoria, which transfer nutrients from the host to the parasite.
- The hermaphroditic flowers, which mean it's both male and female,

- are bilaterally symmetrical and grow either in racemes or spikes or singly at the apex of the slender stem.
- Fruits of broomrape are small and abundant and can produce between 10,000 and 1,000,000 seeds per plant.
- These seeds are dispersed by the wind over long distances, which increase their chances of finding a new host.
- Broomrape has tremendous economic importance because of the damage to crops caused by some species.

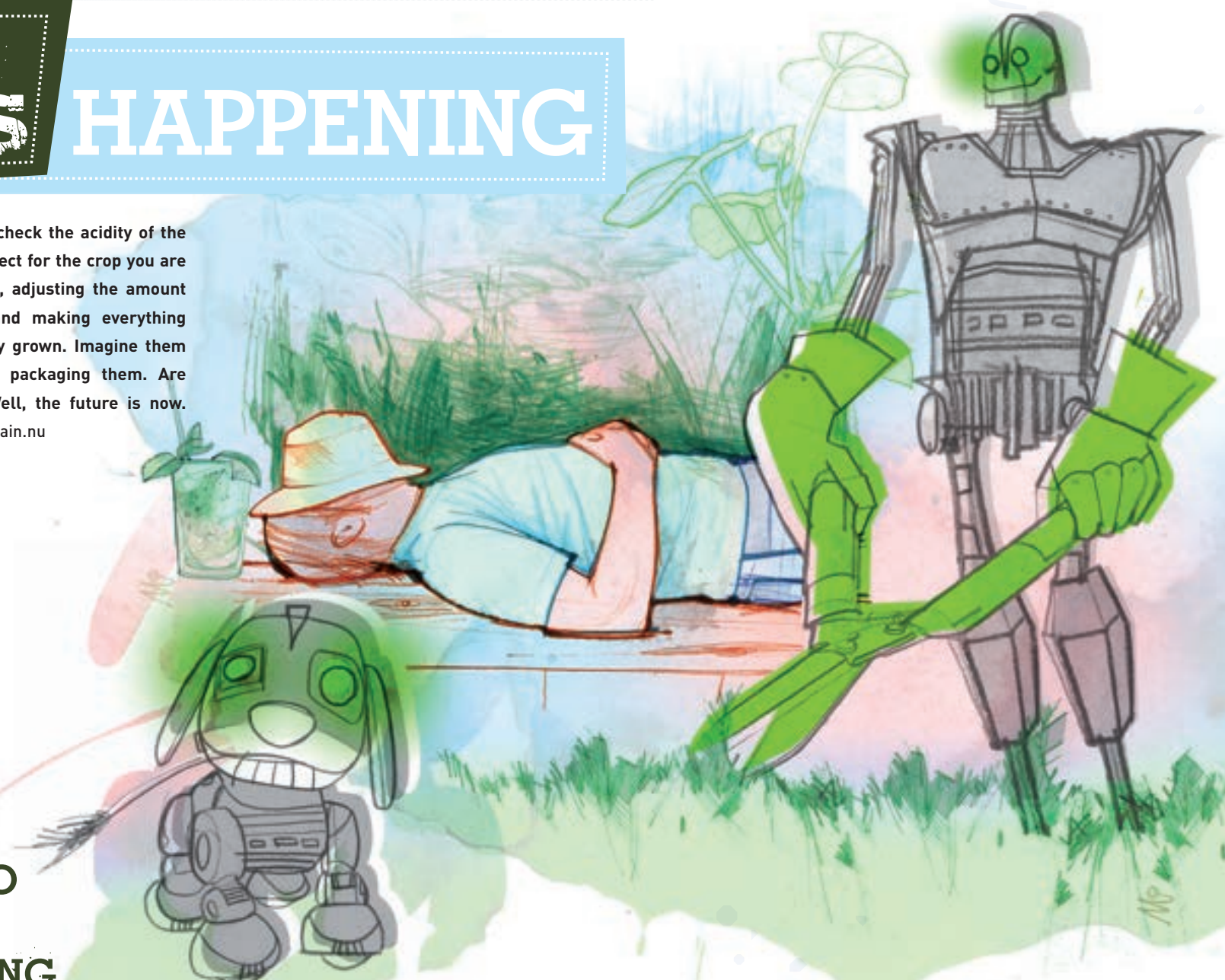
- Especially cereal crops like sugarcane, maize, millet, sorghum, and other major agricultural crops like cowpea, sunflower, hemp, tomatoes, and legumes are vulnerable. In developing countries, it is estimated to affect the livelihood of over 100 million people.
- Broomrape kills 20% to 100% of crops depending on infestation.
- When traveling with, collecting and/or researching broomrape you'll need a permit in most countries.



What's HAPPENING

Imagine a world where robots check the acidity of the soil and make sure it stays perfect for the crop you are growing. Adding a little of this, adjusting the amount of light coming from LED's and making everything perfect until the fruits are fully grown. Imagine them harvesting the crop and even packaging them. Are these visions of the future? Well, the future is now.

By Marco Barneveld, www.braindrain.nu



WELCOME TO THE FUTURE OF GARDENING GREEN FINGERED ROBOTS

There is a lot of experimenting going on with robotics in farming. Understandable. Fewer farmers are increasingly under pressure to feed more people. The UN predicts that the world population will rise from 7.3 billion today to 9.7 billion in 2050. Plus, this growing population has become pickier about the food they eat. In the EU alone, the organic market grew by 7.4% in 2014 with sales valued at \$26 billion. Beyond organic food, there is an overall push to make farming greener by using less water and pesticides. On the other hand there are less people with a desire

to become a farmer. Enter the robots, enter precision agriculture enter high-tech. And which country is trailblazing this exciting, and for some, gruesome future of gardening? Japan of course. They love robots over there. The Nomura Research Institute predicted in a recent report that robots could perform nearly half of all jobs in Japan by 2035, most likely in "non-creative" sectors such as customer service, goods delivery and... agriculture. So, it's the land of the rising sun that will open the world's first robot-run lettuce farm starting from mid-2017.

Spread, the company who is opening up the robot farm says that the robots will be handling almost every step of the process. The only thing humans will need to do is plant the seeds, for now. "The seeds will still be planted by humans, but every other step, from the transplanting of young seedlings to larger spaces as they grow to harvesting the lettuces, will be done automatically," said JJ Price, Spread's global marketing manager. Don't think this is a small fry farm with a couple of nerds running an experimental futuristic but unfeasible experiment. Oh no. We are talking about a vast indoor farm in Kameoka, Kyoto prefecture. They are already doing industrial growing on a large scale with a production of 21,000 lettuce heads a day. With the innovation of robots doing everything from re-planting young seedlings to watering, trimming and harvesting crops the production will boost to 50,000 heads of lettuce a day. Spread plans to raise that figure to half a million per day within five years. The farm, measuring about 47,400 sq ft, will have floor-to-ceiling shelves where the produce is grown. The use

of LED lighting means energy costs will be slashed by almost a third and about 98% of the water needed to grow the crops will be recycled. The automated system will handle the lettuce, but will also control the temperature, humidity and CO2 levels, as well as sterilize water and control light sources. The pesticide-free lettuce will contain more beta-carotene(an antioxidant) than other farm-grown lettuce, the company claims. And no, there will not be little R2-D2's zooming around dressed in waxed jackets and tweed caps. The future has way less personality. Instead, Spread's machines look more like conveyer belts equipped with custom-made robotic arms that can transfer lettuce seedlings without harming them. Spread plans to, uh, spread by building more robotic plant factories elsewhere in Japan and, eventually, overseas. We are standing on the verge of a huge revolution in farming. This is just the beginning of a tidal wave of robotics in farming. Not only in Japan but also in developed countries elsewhere in the world, vast piles of cash are pumped into research and development. However, Japan is leading the way. A robot developed by the firm Shibuya Seiki can pick strawberries at the rate of one every eight seconds. Last December, Panasonic began field tests of a robot that uses a camera and image sensor to detect ripe tomatoes on the vine, before picking them and without damaging them, at the rate of about one every 20 seconds. This is just the beginning of a development that will ensure enough food for the ever-expanding human population of planet earth. The future is now. •

Figure 4: Rows of multi-layered growing chambers. Minimal human involvement required





Pests & DISEASES

Parasitic wasps are one of the most abundant natural enemies available and probably one of the least understood ecologically. Many of them are considered beneficial to humans because they control populations of agricultural pests. Others are unwelcome because they are hyper parasitoids, attacking beneficial parasitoids.

PARASITIC WASP



PARASITIC WASPS

In this article we will explain a bit about parasitic wasps in general. In a future article we will look at some of the more common and most used parasitic wasp in more detail. These wasps lay eggs onto other animals, which their larvae then feed on. In many cases, the hosts are still alive when their insides are being eaten. This ensures a living larder chock-full of fresh food. When the larvae are ready to pupate, they normally kill their host. Until this point, they are completely dependent on their hosts for nourishment and protection. This lifestyle has an unusual name. The wasps are not strictly parasites like tapeworms, as parasites don't, as a rule, kill their hosts. But they also don't kill their hosts as quickly and surely as a predator like a lion would. They are somewhere in between: "parasitoids".

All parasitoids specialize in attacking one host species, usually during a particular stage of its life cycle. This specialization has given rise to a huge diversity of parasitoids. Estimates about the number of parasitoid species vary widely: most are tiny, so there are many undiscovered species. A bizarre feature of the life history of some parasitic wasps is the ability to drastically alter the behaviour of their host to their own benefit. Parasitic wasps in the families Ichneumonidae and Braconidae inject a polydnavirus into the host along with their eggs. The virus infects the host cells and modifies the host's immune system so that it cannot encapsulate the wasp eggs and kill them before they hatch. A female emerald wasp (*Ampulex compressa*) injects chemicals in the brain of its cockroach target, which alters the behaviour of the cockroach, allowing the wasp to lead it along docilely. The wasp leads the cockroach to a burrow, lays an egg on its underside, and then walls up the burrow without the drugged cockroach ever trying to escape.

Appearance

Like other wasps, parasitic wasps have a constriction between the thorax and abdomen that gives them the appearance of having a "waist." Parasitic wasps are

generally small (an inch or less long, and most are less than 1/4 inch long). Their size is generally based on the size of their host e.g. Cicada killer wasps are huge (2 inches or longer), and Trichogramma wasps are the size of the period at the end of this sentence because that is the size of the insect eggs that they attack. They are slender, hairless flying insects with 2 pairs of clear to smoky membranous wings (a few species are wingless as adults) and their antennae may vary from short to rather long. Many are black or brown, but a few are a metallic bluish or green and some have bright yellow or orange markings. Female parasitic wasps use their ovipositor, an egg-laying organ at the tip of their abdomen, to lay eggs on or within their host. Some ovipositors are long enough to reach insects hidden inside cocoons, within trees, and other protected locations. Although the ovipositor may be noticeably large, only a very few species of parasitic wasps have an ovipositor capable of piercing human skin.

Lifecycle

In general, parasitic wasps have a complete life cycle with egg, larval, pupal, and adult stages. However, the life cycle of a parasitoid wasp varies with the species of wasp and some have the most complex life histories known in the animal kingdom. Eggs are rarely seen, as they are usually inserted within the eggs or bodies of host insects. The pupae of some parasitoid wasps may be seen as small whitish/yellowish, rice-like cocoons on or near parasitized insects. In some species, males are not known to exist and the females produce offspring without mating. Usually each parasitoid egg produces a single larva. Some parasitic wasps have multiple generations within a season while others may take a year or more to complete their development. All parasitic wasps live part of their lives developing internally or on the outside of their host.

Use

Different species of predatory wasps are available commercially for mass release, particularly in greenhouse settings. From the point of view of the farmer or horticulturalist, the most important groups are the Ichneumonid wasps, which prey mainly on caterpillars of butterflies and moths; Braconid wasps, which attack caterpillars and a wide range of other insects including greenfly; Chalcid wasps, which parasitize eggs and larvae of greenfly, whitefly, cabbage caterpillars, and scale insects; and Tachinid flies, which parasitize a wide range of insects including caterpillars, adult and larval beetles, and true bugs. •

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

Figure 5: Parasitic wasps can target many different types of insects. There is a specific species of wasp that targets each individual type of insect. Let's hope they don't figure the same process out with us humans.





COIR

COMMON FORMS AND APPLICATIONS

"I'VE GOT A LOVELY BUNCH OF COCONUTS, FIDDELDY-DEE." WHENEVER I MENTION TO MY DAD THAT HE SHOULD REALLY GIVE COCO COIR A GO IN HIS GREENHOUSE, THIS IS WHAT HE USUALLY ENDS UP SINGING IN RETURN. I'M NOT SURE IF IT'S AN AGE THING BUT SOMETIMES CONVINCING THE OLDER GUYS TO USE ANYTHING BUT PEAT IS BIT LIKE TRYING TO CONVINCING FLAT EARTHER'S THE MOON ISN'T REALLY A GIANT HOLOGRAM. HE IS ALREADY SET IN HIS WAYS I GUESS, UNLIKE THE NEW GENERATION. THEY HAVE EMBRACED COIR AS AN ALTERNATIVE FOR GROWING WITH MUCHO GUSTO.

By NICO HILL

At the very least, coir does look a little bit like peat. So that's the first hurdle overcome for the older boys to begin considering it as an alternative. Other aspects of growing with coir aren't quiet as similar though, but not so far removed that it should become a daunting challenge for them. Coir is a fantastic medium to use. All it takes to get the most out of coir is understanding the nuances that make it so great, and ultimately how you can use them to your advantage.

That's essentially the premise of this entire article. We are going to lay bare the principles of coir as a substrate and dig deep into its many forms and applications thereof.

Knowledge is power folks. The right sort of knowledge of course. Harking back to the flat Earth example, the right mind set combined with the wrong information can prove to be an entirely different scenario altogether.

Pure Coco

The easiest (and actually the most practical) way in which to make use of coir is completely pure and unadulterated. Like we eluded to earlier, coir has it's own very unique physical properties both in terms of aeration/water retention and also nutrient holding abilities or Cation Exchange Capacity(CEC). While combining other materials



into the mix can sometimes have positive benefits to plant growth, it can also sometimes overly complicate the inner workings of the substrate to the point where it will actually stifle any advancement. To begin to understand exactly why this is, we first need to look at the individual parts of the equation, rather than just focus on the sum.

Forms of Pure Coir

Currently available in any self respecting grow shop will be a plethora of different brands of coir. What you need to be able to deduce as a discerning shopper is what the differences are between them and which of them are likely

to work best for your particular grow room and irrigation system. There are three main horticultural grades of coir used by the various brands on the market, and each brand will have a slightly different percentage of each in their own particular recipe. They will generally be a combination of:

Pith/Dust

The super fine particles of dust, called pith, remaining from the washing and buffering process. Excellent water holding capabilities and an ideal base for starting seeds. However too much dust will result in compacted and poorly aerated medium.





COIR

A coir substrate can be a combination of different sized particles, each with their own properties.



Pith/Dust



Coarse



Coarse chips

Coarse

Slightly larger and more strand like, fibrous coir that provides an excellent source of air pockets and offers great drainage capabilities. The natural capillary action of the fibrous strands help provide a more even saturation throughout the pot.

Coarse chips

Larger coarse chips and fibrous strands. Provide an abundance of air pockets, and a fantastic level of drainage. Using exclusively this grade as a medium offers the high end efficiency and usability of a more inert substrate like rockwool, yet it is still classed as an organic substrate.

Bags, Slabs or Blocks?

So once a healthy balance of the three grades of coir has been determined, they are combined and bagged up for sale. Most commonly you will find it loose filled in 50 Liter bags, that should be measured out according to strict EN regulations. Loose fill bags are most certainly the easiest to use but when you have a dozen or more bags to move, transportation problems can rear their ugly head.

Coir in slabs offers the possibility to install a coir based system in exactly the same way as you would with a rock wool slab system. Making use of the chip grade of coir within slabs offers a surprisingly efficient, and natural alternative to rock wool. However, if the more complex irrigation strategies that come with this type of substrate put you off, then the more fibrous grade of slabs offer a happy medium between the two.

Blocks of compressed coir make for a fantastically transportable medium. No huge and heavy bags to carry around, just a nice and light compressed block. In general, the problems that come with compressed blocks is that they are typically made of poorly washed/buffered coir and that you have to spend quite some time ensuring it all expands nice and evenly. However, in more recent times you can find compressed coir that is of exactly the same quality you will find in a premium loose fill bag and you can find brands that have innovative methods for expansion that take all the effort out of it for you. Just be sure to choose a reputable source.

Amending Coir

People always want the next best thing. When the next best thing isn't on the market yet, people tend to try and create it themselves. While results with using pure coco as a growing medium cannot be easily argued with, there are of course situations in which amending the mix can prove beneficial to a particular grower's circumstance. Understanding what you are doing to the properties of the mix as a whole is key to achieving these benefits. However you amend your coir it will affect the resultant properties in either one or both of two ways: mechanically or chemically.

Amending to alter mechanical properties

When products like perlite, vermiculite or clay pebbles are added to coir, they are primarily affecting drainage and aeration of the total medium. As well as the natural

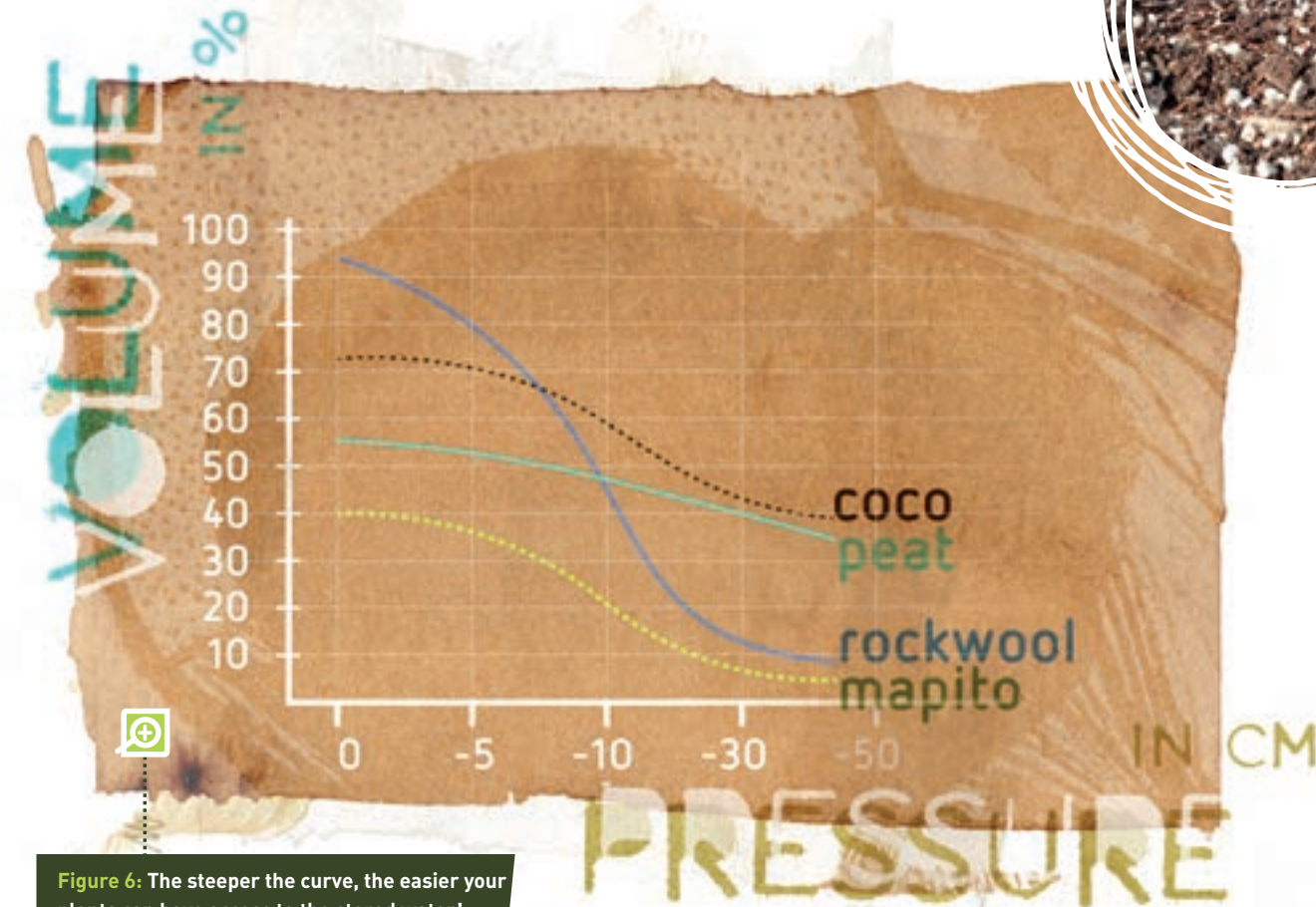


Figure 6: The steeper the curve, the easier your plants can have access to the stored water!

differences in shape and size that affect this, every substrate has its own capacity to hold on to water. You can see in the graph pictured here, four typical media. Along the Y axis is their volume in water and along the X axis the pressure at different heights in cm. As the height increases so too does pressure and each medium retains a different proportion of its entire water holding capacity. Essentially this shows how well each of them holds on to water, or you can look at it another way and say it is their willingness to let go of water.

Looking at the blue line for rockwool, you can see it has a higher initial water holding capacity than coco, and the quick curve downwards shows that it lets go of water more easily and to a lower end point than coco.

By comparison, looking at the black dotted line for coir, it has a much higher initial water holding capacity than peat and lets go of water at a quicker rate than peat to an almost similar end result. The shallow green line for peat indicates that peat really likes to hold on to water compared to the rest!

So primarily what you will notice when amending with perlite or clay pebbles is the pot drying out at a faster rate and so an increased frequency of irrigation will be necessary. This is because you are reducing the overall water holding capacity of the pot as a whole and also because you are 'watering down' the coir and thus reducing its resistance to water loss under increasing

pressures. What you would see the line become on the graph is a slightly lower starting point, with a slightly steeper downward trend in the middle, to a slightly lower end result.

It is not just the mechanical properties of coir you will affect with pebble or perlite amendments, particularly with some brands of pebbles. Many residual salts can be left behind which can play havoc with coir's own natural CEC, and particularly how it has previously been buffered. Make sure to choose only the cleanest of sources when wanting to amend mechanically alone.

Amending to alter nutritional properties

This is generally where it tends to become tricky with coir. As mentioned earlier it's by no means a direct replacement for a peat substrate and nowhere is that more evident than when it comes to adding chemical or organic fertilizers to it. The main contributing factor is the Cation Exchange Capacity (CEC) of coir.

Don't get scared by the scientific looking words. In a nutshell (excuse the pun) all it really means is the total storage capacity something has for nutrients. What it actually is, is a measure of the amount of negatively charged sites that a potential positively charged cation could adsorb to. So the higher the CEC, the higher the potential storage capacity for nutrients there is.

Although coir does have a relatively high CEC, compared to peat, there is little to boast about. What this means is



COIR

that if you amend with a chemical fertilizer, its longevity in coir may not be what you are used to with a peat mix. With the lower CEC there is not the capacity to hold all the immediately soluble cations and so a lot more is washed out on each watering relative peat.

Longer term organic amendments may seem like a more tempting route to go down, as with the slower release of nutrients, it will not be washed out of the fibres as quickly as a chemical fertilizer, but do not be so hasty in going down that route. The overall properties of the medium will be altered which will in turn causes further issues. Organic amendments will have their own unique pH value, sometimes high, sometimes low. Adding these amendments into your coir will either raise or lower the overall pH of your substrate accordingly, often to detrimental levels. This will cause significant swings in pH that would otherwise be negated in a peat mix with its lime buffer.

Secondly, on top of not having the long term storage capabilities of nutrients in the way peat does, you can never be quite sure what exactly is being released by the amendments, and at what rate they are being released. This could very easily have knock on effects to the other type of buffering in coir, calcium. This in turn could have a detrimental effect on the overall availability of elements in the nutrient solution that you (try to) supply to the plant. As an obvious example, it might be getting less calcium and more potassium than it should.

Thirdly, organic amendments very much depend on a healthy and diverse micro life present in your substrate. Some of the more premium coirs on the market will contain trichoderma, but solely relying on those will not cut the mustard when it comes to an efficient cycling of organic based additives. The result of which will be an insufficient and sporadic release of the nutrients, so you will never quite know where you stand with what is actually in your container.

Using Coir as an amendment

Another possibility for coir is that it can be utilized as an amendment itself. With all the hullabaloo surrounding the continued availability of peat as a sustainable medium, it's now more and more common to find peat mixes that contain a high level of coir as a total percentage of the substrate. It can make a fantastic additive to a peat based mix when used correctly, and it's different physical properties properly accounted for. (Usually no



Figure 7: Coir can be mixed with many amendments.

more than 30% before the attributes of the coco affect the way the final mix will work as a whole) Similarly, coir can be used to great effect to improve and condition poor types of soils in an outdoors environment. A dense clay soil could benefit immensely from the addition of coir. The coir will help prevent compaction and introduces a much greater level of aeration and drainage to the soil as a whole.

Keep It Simple Stupid

Coir is a fantastic substrate on its own right. The ease of use and efficiency it has is almost second to none. If you do choose to amend your coir, you could potentially be walking into a hit-and-miss situation. If you do go down this route, make sure you take it slowly and don't go straight in and overload it with everything in the cupboards all at once. More often than not, you will find it is best to leave the cupboards alone altogether. Mother Hubbard will thank you for it as well as your plants. •



Figure 8: Coir comes in all shapes and sizes, the right one for you is nearly a matter of choice

Grower's

TIP #35

By your friend SEZ

RE-USING COCO IS EASIER AND SAFER THAN YOU THINK!

There are many good reasons to re-use a growing medium; saving time, money and being eco friendly are among them. A good quality coco makes this very easy!

A good quality coco medium does not break down as fast as other media, like peat. As coir does not tend to be easily struck by disease, which makes for a very good medium to re-use. Potentially up to a few times before discarding to the garden where it makes a great soil amendment.

1. Before re-planting, first verify salt levels of your coco. If the previous crop ended properly, salt levels should be fine. In any case, you should always proceed to the 1:1.5 extraction method to be sure (described in the CANNA Coco DVD and CANNA website). Keep in mind that high salt levels can reduce crop potential.
2. While you're digging your coco for test samples, look for critters. If you happen to see an overwhelming amounts of bugs, you might want to skip re-using and go straight to soil amending.
3. Avoid using "re-used" coco for seedlings or young cuttings; these are by definition, quite fragile. Therefore starting in new, fresh coco is a safer path. Re-using coco should be saved for healthy thriving plants.
4. Once the crop is finished, pull the old root ball out (some people use a knife or small saw to carve the stump out). Put in the new plant and fill the gap around the new root ball with new coco. The final stage of the previous crop might have lowered the intensity of the calcium buffer, which will be replenished as you feed your plants. When emerging roots get to the re-used coco part of the container it will all be perfect and balanced again.
5. Water profusely with calcium rich, coir specific nutrients and a good rooting stimulant until run-off occurs. Then inspect carefully to make sure there are no air pockets (fill them up with fresh coco if needed) and that is it!

Enjoy your saved time and money!

Some growers are hesitant to re-use their Coco because of the decaying dead roots that remain. Using a quality enzyme product like CANNAZYM will decompose those roots before they become a food source for pathogens. On top of increasing aeration in the growing medium along with providing nutrients for the plant and beneficial microorganism of the root zone.

Used coco is very good to amend outdoor flower beds, gardens or any other area where the soil has compacted. It will bring back aeration as well as improving water retention.

Good luck and Happy Gardening! •



Puzzle & WIN

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

WIN A 1 LITER BOTTLE OF CANNA PK13/14



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



PRIZES

You might be lucky this time! Another great prize is waiting for one of you. You just have to send us the correct solution (sending the middle part of the puzzle to editor@cannatalk.com and mention CANNAtalk 33 is enough), and if we pick your name,

A BOTTLE OF CANNA PK 13/14 COULD BE COMING YOUR WAY.

Winner puzzle #32

The winner of last Sudoku is **Mr Rogers**. Congrats on your 1 liter bottle of CANNABOOST! We will contact you as soon as possible to make sure you receive your prize. Enjoy!

Facts



TOMATOES RESIST PARASITIC VINE BY DETECTING PEPTIDE

Tomato plants deter attacks from a parasitic plant that's known to ravage crops by detecting one of its peptides, a new study reveals.

Worldwide, parasitic plants cost billions of dollars in crop losses, but a better understanding of how some plants fend off invaders could help efforts to mitigate these losses. *C. reflexa* is a parasitic, leafless vine that infects the stems of most dicotyledonous plants -one exception is *S. lycopersicum*, a species of tomato.

Plants are sometimes able to detect disease-causing microbes by the distinct peptides that these invading plants release, which prompts the host plant to secrete the stress-related hormone ethylene.

Scientists suspected that the *S. lycopersicum* tomato might take a similar strategy when facing the plant parasite *C. reflexa*, which they confirmed. When the team induced expression of the corresponding gene in the leaves of two other plant species both plants reacted to presence of the *C. reflexa* peptide with increased production of ethylene, and exhibited increased resistance to *C. reflexa* infestation.

A 'FITBIT' FOR PLANTS?

Knowing what physical traits a plant has is called phenotyping. Because it is such a labor-intensive process, scientists are working to develop technology that makes phenotyping much easier.

For that reason the tool Phenocart is developed, and it captures essential plant health data. The Phenocart measures plant vital signs like growth rate and color, the same way a Fitbit monitors human health signals like blood pressure and physical activity.

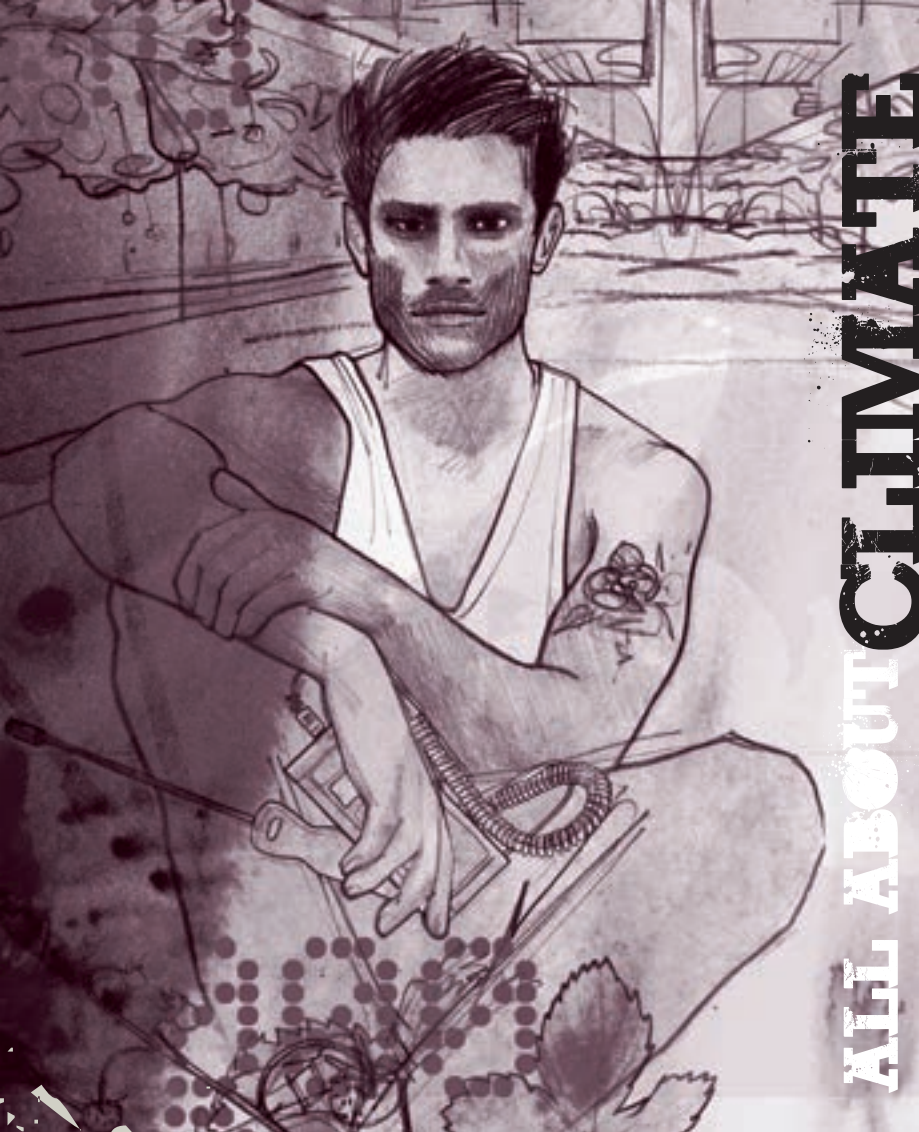
The Phenocart is a collection of sensors. The sensors are attached to a repurposed bicycle wheel and handles that a plant breeder can easily push among plants in a field. The Phenocart rapidly collects data as it's pushed among the plots. Scientists can outfit the Phenocart with different sensors depending on what they want to measure.



MIX UP PLANT SPECIES TO KEEP SOIL HEALTHY

When it comes to keeping our soil healthy, maintaining plant species diversity is key, according to new research published in the journal Ecology Letters.

Across the globe, soils are under threat. Due to changing land use (to feed a growing population), climate change and contamination of land with toxic chemicals this precious resource is deteriorating. This poses a serious threat to our future food security. When it comes to keeping our soil healthy, maintaining a wide diversity of plant species is key according to new research. Professor Richard Bardgett of The University of Manchester said: "Soils are severely degraded in many parts of the world and these findings suggest that enhancing plant diversity could be an important way of speeding up their restoration to bring back fertility. It is almost like different combinations of roots can be used to engineer the soil, working to enhance its physical structure which is key to soil health."



WHAT'S NEXT

The next issue is all about your climate. We're going on an extensive journey to see exactly what influences your plants growth from both above and below the ground. Then of course a little look at how exactly you can go about adjusting these parameters to ensure your crops achieve and maintain optimum form and function. Ever wanted to be master of your surroundings? Like some sort of ancient Kung-Fu master, but for plants? Then this next issue is one you most certainly cannot afford to miss!

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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? And that your favourite magazine is printed in a carbon-neutral printworks?



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English You reap
what you sow.

Dutch Zoals men
zaait zal men
oogsten.

In other words, growers who know CANNA can be confident they'll yield quality plants.

Welkom to the Dutch way to grow.