CANNAtalk®

MAGAZINE FOR SERIOUS GROWERS

ISSUE 26 2014

GOOD QUALITY

Soilless growing media

LUMBERJACK SPORTS

Start chipping wood!

COURGETTE

Race car of veggie world

And more:

HQTalk:

Wow what a summer it's been! Finally we had a summer with some gorgeous days, BBQs, beer and lots of football. You might not remember it anymore as England were knocked out of the World Cup after their second match, but Germany became the world champion. And what a great championship it was! All in all a great summer, what more do you want? Well, we can imagine you would also like to have a great harvest?

So, our CANNA researchers have been busy all summer, sweating away to make sure they can share all their knowledge with you about growing soilless media. There are so many different types of media that it can be difficult to sort out what's what. In the first research article, we'll give you an overview of the different types of soilless media and their characteristics. In the second research article, our researchers will help you make the best decision about which medium suits you best.
In our Grower's Tip section, we will explain all about the pH of the growing medium. And if you already know everything about growing media? Well, then there's more for you in this edition, like the Pests and Diseases section which is about snails and slugs, our What's Happening article about lumberjack sports and of course the Questions and Answers feature. You can read all this in this edition of CANNAtalk... 32 pages counting!

And don't forget, we want to hear from you! Please give us your opinion about the magazine via the website www.cannatalk.com or via the response card that you find in the back of the magazine.

Remember, the more you read, the more you know!

Regards,

Karin

Contents

WHAT MAKES A GOOD-QUALITY SOILLESS GROWING MEDIUM

SUBSTRATE	BULK DENSITY	WATER RETENTION	POROSITY	CATION EXCHANGE CAPACITY	DECOMPOSITION RATE (C:N)
Bagasse	Low	High	Low	Medium	High
Sawdust	Low	High	Medium	High	High
Rice hulls	Low	Low	High	Medium	Medium
Vermiculite	Low	High	Medium	High	Low
Peat moss	Low	High	High	High	Medium
Bark	Low	Medium	Medium	Medium	Medium
Coconut Coir Dust	Low	High	High	Medium	Low
Sand	High	Low	Medium	Low	Low
Units	(g/cm^3)	%	%	(meq/100g)	ratio
Low:	0.25	20	5	10	1:200
Medium:	0.25-0.75	20-60	5-30	10-100	1:200 - 1:500
High:	0.75	60	30	100	1:500

Table 1: Physical and chemical characteristics of soilless mediums (adapted from Johnson (year unknown); Abad et al., (2005) and Asiah et al., (2004)).

THANKS TO THE DEVELOPMENT OF 'SOILLESS CULTURE', HORTICULTURE HAS EXPANDED INTO DIFFERENT REGIONS, ENABLING FARMERS TO PRODUCE HIGH YIELDS AND PRODUCE HIGH QUALITY CROPS, EVEN UNDER ADVERSE GROWING CONDITIONS. THE FIRST TERM USED FOR SOILLESS GROWING MEDIUM SYSTEMS WAS 'HYDROPONICS' BY WILLIAM FREDERICK GERICKE IN THE 1930S. THIS TERM DESCRIBES THE METHOD OF PROVIDING MINERAL NUTRIENT SOLUTIONS (DISSOLVED FERTILISERS IN WATER) TO SUPPORT PLANT GROWTH AND DEVELOPMENT IN THE ABSENCE OF SOIL. By CANNA Research

The term was later changed to soilless medium cultivation since the major constituent of the medium may be a solid or liquid, with organic or inorganic substrates. In principle the soilless medium is a substrate that is part of an artificial system of cultivation in which plants are grown without soil. The medium provides plants with physical support, regulates the water flow, serves as reservoir of nutrients and permits gas exchange to and from the roots.

Soilless culture systems are classified according to the type of substrate (soilless medium) they use, how the nutrient solution is delivered to the plants (drip irrigation, flowing or stagnant nutrient solution) and what happens to the solution after it drains away such as open (free drain) or closed (recirculating water). Soilless media can be inorganic (e.g. sand, gravel, pebbles, perlite, rock wool, vermiculite), organic (e.g. rice hulls, peat, sawdust, straw, coconut coir) or synthetic (e.g. foam ship, sponges, moisture absorbent plastic fibre). Thanks to the range of soilless media, horticulture has developed around the world, enabling farmers to produce food and ornamental plants with high yields and to sell high-quality commodities (Gruda, 2009).
The quality of a soilless medium involves many indicators and its assessment varies from one region to another, depending on the opinions of individual farmer as well as their management goals such as productivity, quality, waste recycling and/or sustainability. As for what makes a soilless medium a good growing medium, the physical, chemical and biological properties should be considered when assessing the functioning of the system.

Basic requirements for a good growing medium

Soilless growing mediums are used for horticultural purposes around the world. The selection of indicators is less complex than for soils, since soil has multiple uses (e.g. agriculture, forestry, engineering, recreation, construction, etc.), according to its physical and chemical properties. For instance, the quality of soil destined for construction purposes will be very different from that of soil that is good for agriculture. The indicators that define a good growing medium will always be for agricultural purposes.

Many types of soilless growing medium are used in horticulture and selection will depend mainly on the expertise and experience of the grower, availability and cost. As part of the seventh framework programme of the European Union, the EUPHOROS project (Efficient Use of Inputs in Protected Horticulture) (Pardossi et al., 2011) mentions that the ideal soilless medium should have some physical and chemical properties as follows:

- A uniform texture that drains well but retains nutrients and water for the root system.
- Low bulk density to facilitate installation and transportation (between 190 and 700 kg/m3).
- High porosity (between 50% and 85%).
- Particle-size distribution to maintain good balance between air and water retention (between 0.25-0.5 mm).
- A pH between 5.0 and 6.5, which can also be adjusted easily.
- Low content of soluble salts.
- Chemical inertia which means that the substrate does not affect the nutrient solution by releasing inorganic ions or immobilising nutrients.
- Ability to maintain original characteristics so that it can be used for many successive cultivation cycles.
- Absence of pathogens and pests (but not necessarily sterile), and free of any compounds toxic to plants.
- Ability to be produced in uniform batches (to allow the use of consistent fertilisation programmes).

Besides these qualities, another characteristic of a good-quality soilless growing medium is its ability to recover from growers' mistakes such as overwatering or over-fertilisation, as mentioned by Stan Claasen (a Dutch horticultural grower - personal communication).
A comparison between the main physical and chemical characteristics of the most commonly used soilless growing media (see table 1) gives an overview of the possible advantages and disadvantages of using one or other substrates, besides the interesting possibility of combining them.

When using bagasse (made from sugar cane pulp waste) alone, for instance, its high rate of water retention and low porosity will lead to poor aeration and drainage. On the other hand, rice hulls have low water retention and high porosity which leads to plant water stress if it is used alone. Both rice hulls and bagasse have a high decomposition rate and therefore require high

Figure 1: **Water retention and porosity are important indicators for growing media, which should have a good balance in order to optimise the flow of nutrient solutions to the plant. When using bagasse (1) alone its high rate of water retention and low porosity will lead to poor aeration and drainage. Rice hulls (2) have low water retention and high porosity which leads to plant water stress if it is used alone.**

nitrogen fertilisation input to avoid competition between micro-organisms and plants to uptake nitrogen. When looking at the characteristics of each soilless medium, a combination of these can usually provide a satisfactory alternative for growers. However, combining substrates should not simply be done on the basis of availability and cost reduction, and should take account of basic properties like those mentioned in table 1.

When the growing medium supports plants and regulates water flow

Bulk density reflects the ability of the medium to function as a structural support, water and solute movement, and aeration. It expresses the weight of the soil or medium particles in terms of volume. The solids and pore space are thus considered together as the weight of the soil or medium. If the pore space is very low, the soil or growing medium will easily suffer from compaction (figure 3).

Mineral soils have an average of 1400 kg/m3 bulk density with about 47% pore space. This compares with soilless growing media like sphagnum peat and vermiculite which have a bulk density of 125 kg/m3 and around 93% pore space, or coconut coir dust with a bulk density of 40 to 80 kg/m3 and approximately 87.5% of pore space (Argo, 1998). The figures demonstrate the large difference in bulk density and pore space between soils and soilless growing medium, with soils being the heaviest growing media while the lightness of soilless media allows easy handling and transportation; however this does affect other indicators such as **porosity** and **water retention**.

A combination of low porosity and high water retention would lead to poor aeration and drainage. By contrast, high porosity and low water retention would lead to water stress in the crops. These are important indicators for growing media, which should have a good balance in order to optimise the flow of nutrient solutions to the plant. In naturally occurring soil, these indicators are more difficult to control due to slope, texture and climatic conditions.

During cultivation, the indicators mentioned above (porosity and water retention) may change due to the decomposition of the organic matter, root activity, the swelling and shrinkage of the substrate particles and the process of compaction. However, physical modifications may only occur after one or two growing cycles depending on the nature of the substrate and type of crop, allowing the growing medium to be re-used (Pardossi et al., 2011).

There is an ongoing debate among scientists, some of whom state that crop yield is affected when growing medium is re-used, while others affirm that the differences are almost negligible. Based on the physical properties of the growing medium, the concept of 'reusing the substrate' is often based on 'green' arguments, while profitability prevails as the main objective among growers.

When the growing medium serves as a reservoir for nutrients

Soils contain very diverse ecosystems of micro and macro-organisms, including plant communities. The complex interaction between them is balanced, allowing plants and animals in the soil to survive or recover without human intervention. Production yields may, however, be as high as growing in soilless growing medium where human intervention is required.

The main difference between soilless growing media and soil is the presence of soil biota diversity and organic matter. In soil, the amount of organic matter is the most important indicator of soil quality. When organic matter enters the soil, for instance like manure or crop residues, the carbon compounds in the substrate are broken down at different rates. This degradation process varies according to the properties of the organic matter introduced, the populations of the soil biota (organism living in the soil) and the physical and chemical circumstances (moisture content, temperature, pH, etc.) which affect the breakdown, decomposition rate and release of nutrients. The more the decay, the 'better' the soil, the more active the soil biota and the richer the biological rewards for the crop (Janzen, 2006). Growing medium lacks soil biota and organic substrates, which sometimes provide organic matter but are generally not degraded thoroughly.

The lack of soil biota and easily decomposable organic matter in soilless culture means that a constant supply of nutrients needs to be provided through the nutrient solution, while in soils the nutrients are released as organic matter decomposes. This means that indicators like water retention and porosity are more relevant for soilless growing media. Nutrient solutions are the key element in the irrigation systems of soilless culture. They contain micro and macro nutrients dissolved at different concentrations. Standard formulas have been developed for many crops such as tomatoes, cucumbers or strawberries; however, these can be adjusted according to the prevailing climatic conditions (due to surface evaporation water from the growing media and temperature), water quality, location and stage of the crop.

Chemical inertia is another characteristic of growing media that constitutes a significant difference with mineral soils. In principle, not all elements need to be applied to mineral soils while for soilless media growers must supply all nutrients, except for carbon, hydrogen and oxygen because these are derived from water and air. As a consequence, the continuous application of nutrient solution in soilless culture systems leads to salt accumulation and ionic imbalances in the substrate.

As mentioned previously, the continuous applications of nutrient solution, especially in closed irrigation systems, can lead to the rapid accumulation of sodium and chloride and a change in the initial pH and imbalance in the desired nutrient supply for the plants. Consequently, the electrical conductivity (EC), or the concentration of toxic elements, increases and can threaten plant development. Open irrigation systems represent an alternative in order to slow the problem of salt accumulation but this involves a massive waste of water and nutrients, which increases production costs and contaminates local ground and

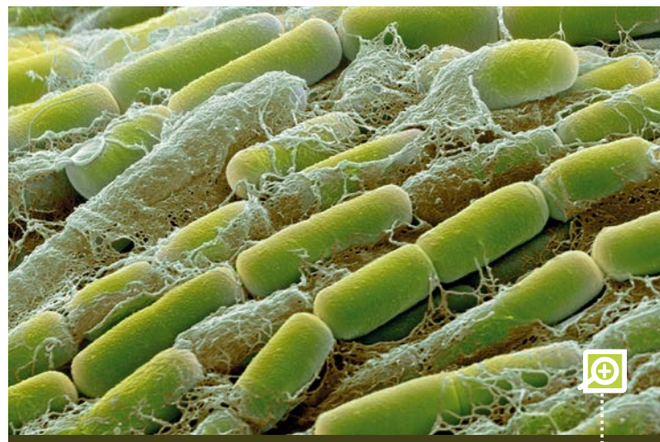


Figure 2: **This is a coloured scanning electron micrograph (SEM) of Bacillus megaterium bacteria. This bacteria is one of the biggest bacterial cells and is found in soil. Soilless media lack soil biota (organisms living in the soil) which means that a constant supply of nutrients needs to be provided through the nutrient solution.**

surface water (Pardossi et al, 2011).
The continuous dilemma between increasing productivity and protecting the environment underlies the European Nitrate Directive (1991), which suggests applying closed irrigation systems to encourage sustainable horticulture, especially in response to concern over high nitrate concentrations in drainage water from soilless culture. The recirculation of nutrient solutions would be advisable until electrical conductivity and/or the concentration of potentially toxic ions reach a maximum acceptable value. Afterwards it is recommended to replace (partially or totally) the irrigation system.

A healthy growing medium and the environment

The disposal of used soilless media following cultivation is a potential threat to the environment as these may contain pesticides, plastic or crop residues with diseases that can be spread (Pardossi et al, 2011). Re-use of the medium is strongly recommended to reduce disposal and production costs but the potential dissemination of soil-borne diseases remains a major concern.
Biological control agents are sometimes added to soilless growing media in order to introduce a microbial community and prevent pathogen populations; however, this is not a guaranteed to prevent pathogens (Pardossi et al, 2011). Soil has a very complex microbial community web that can support both pathogenic but also beneficial organisms. Their constant interaction creates an equilibrium in the soil that allows plant growth; without soil to act as a buffer, any failure of pathogenic control or prevention leads to a rapid fall in yield. Special attention to preventing root pathogens is required in soilless culture.
If the grower re-uses the substrate in order to reduce waste, preventing pests and diseases in new cultivation cycles becomes a more relevant and expensive issue, while solving problems relating to excessive salinity and pH is easier. Practices like steaming and solarisation, or chemical control (the application of fungicides) are the most common methods for treating growing media so that it can be recycled.

Figure 3: Solids and pore space together, which are expressed in a unit volume, called bulk density. The higher the bulk density, the higher the compaction and the lower the pore space in the soil or medium.

Conclusions

To answer the general question of 'what is a good quality soilless growing medium?' many factors must be considered, including the objectives of the grower, the regions that the substrate comes from as well as where it is going to be used and the type of substrate. Thus, to give a general answer is difficult and unrealistic.
We have discussed physical, chemical, biological and practical properties in order to define a desirable soilless medium. Essentially, the substrate should be able to:

- Provide structural support for the plant.
- Regulate water flow.
- Serve as reservoir of nutrients.
- Provide a healthy environment for the plant to grow in.

To sum up, the characteristics that indicate a good-quality growing medium are as follows:
Physical aspects include a low bulk density (between 190 to 700 kg/m3), high porosity (between 50% to 85%), particle size between 0.25 to 0.5mm and water retention between 20% to 60%.
Chemical aspects represented by the CEC (range between 10 to 100 me/100g), pH easily adjustable (5 to 6.5), low salt content (0.75 to 1.9 dSm-1) and a C:N ratio between 1:200 to 1:500.
Biological aspects indicate the healthy condition of the growing medium due to the absence of pathogens and pests, and the absence of toxic compounds.
Practical aspects such as the capacity of the growing medium to recover from growers' mistakes, its ability to maintain its original characteristics (suitable for reutilisation), and whether it can be produced in uniform batches are relevant in choosing a good soilless growing medium.•

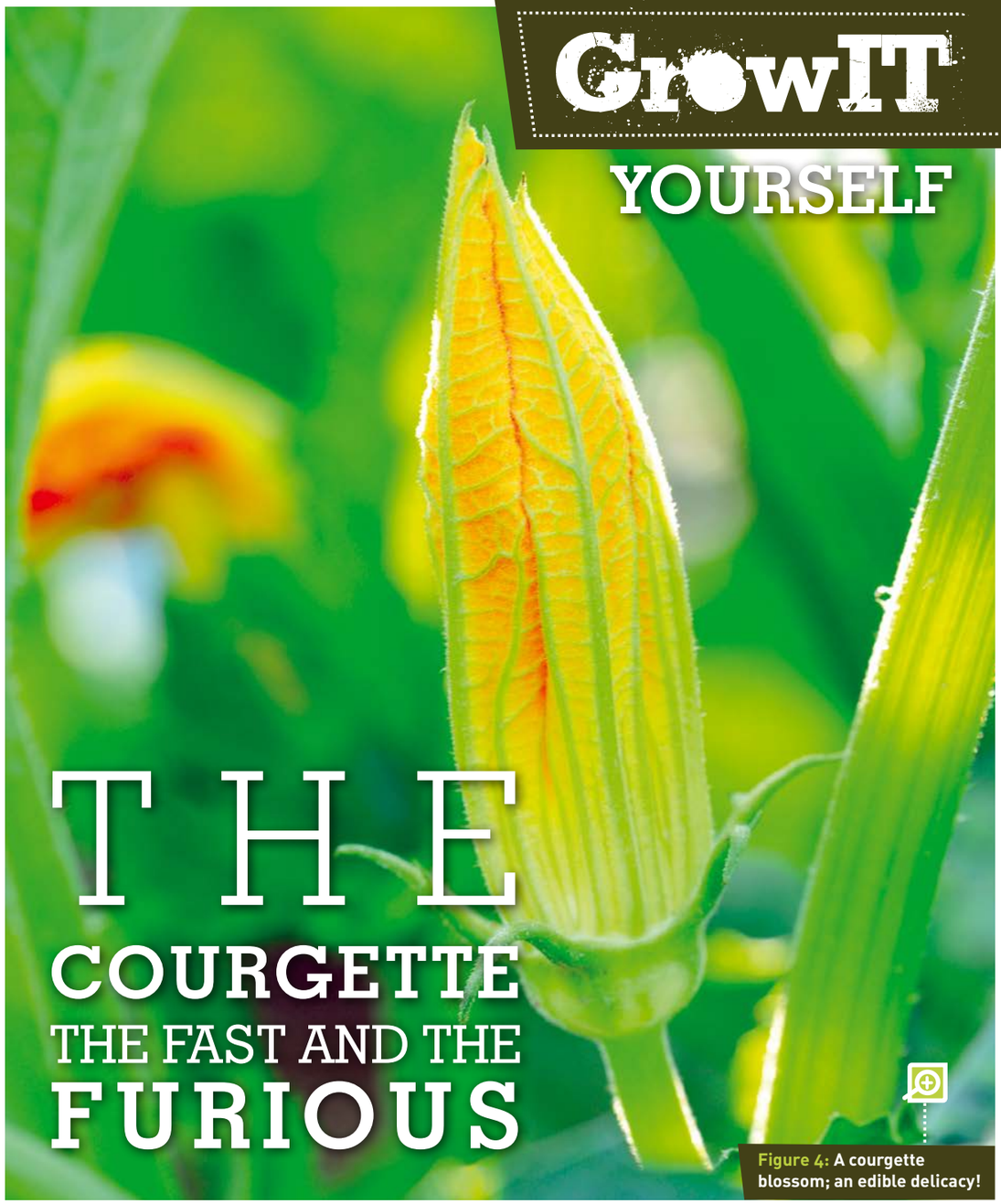


Figure 4: A courgette blossom; an edible delicacy!

THE COURGETTE
THE FAST AND THE FURIOUS

SOME PEOPLE SAY THAT IF A WAR BROKE OUT AND WE DIDN'T HAVE ENOUGH FOOD, THE HUMBLE COURGETTE COULD SAVE THE DAY. THEY'RE EASY AND THE COURGETTE IS ALSO A DEFINITE CONTENDER FOR THE SPEED RECORD OF THE VEGETABLE WORLD. ADD IN THEIR HEALTHY VIRTUES AND YOU'LL UNDERSTAND WHY THE COURGETTE COULD HELP US OUT IN OUR HOUR OF NEED.

By Marco Barneveld, www.braindrain.nu

The courgette: the racing car of the vegetable world. These plants are really fast growers. Sow some seeds today, and you could be harvesting your crop in about 45 to 55 days. These guys are prolific. In some places in the world they plant them in other people's cars, or put them on their neighbour's doorstep. They take sacks of them to work along with recipes for courgette bread, courgette casserole, and grilled courgettes. Hell, they even use

Figure 5: This is a marrow, a larger version of the courgette.

Figure 6: Growing courgettes is easy: sow the seeds in rows or hills, about 1 inch deep. Plant four to five per hill and after they have germinated, keep the best two to three courgette plants.

Photo courtesy of Paul Sullivan

them as baseball bats because they have no idea how to use their bumper courgette crops.

The scientific name for the courgette is Cucurbita pepo, and it is a member of the same family as cucumbers and melons. The inhabitants of Central and South America have been eating courgettes for several thousand years, but the courgette that we know today is a variety of summer squash developed in Italy.
In North America, these are known as zucchini, which comes from the Italian zucchino, meaning a small squash. The term squash comes from the Indian skutasquash meaning 'green thing eaten green'. Christopher Columbus originally brought seeds to the Mediterranean region and Africa.

The French snubbed the courgette for a long time until chefs learned to choose the smaller fruits, which are less bland and watery. The courgette and its larger version, the marrow, is actually a fruit, although most people think of them as vegetables – something that many 'veggie-fruits' like the tomato, cucumber and squash share with the courgette. The courgette doesn't really care. It's too busy growing.

Its popularity in Western cuisine is actually quite new. Less than thirty years ago, the courgette, formerly often referred to as the green Italian squash, would hardly have been recognised. Today, it is not only widely recognised, but a particular favourite of home gardeners. Despite its prolific growing nature, its popularity is probably due to in large part to its versatility in the kitchen, as a vegetable as well as in breads and desserts.

Great health properties

- The courgette is not bad for your health either. The courgette is one of the very low calorie vegetables; it provides only 17 calories per 4oz. It contains no saturated fats or cholesterol. The skin is a good source of dietary fibre that helps reduce constipation and offers some protection against colon cancers.
- And to pull in some big words, courgettes have an anti-oxidant value of 180 Trolex Equivalents (TE) per 4oz. Which might be far below berries but nonetheless, the pods are one of the common vegetables included in weight reduction and cholesterol control programs recommended by dieticians.
- Furthermore, courgettes are rich in flavonoid poly-phenolic antioxidants such as carotenes, lutein and zea-xanthin. These compounds help neutralise harmful oxygen-derived free radicals and reactive oxygen species from the body, helping protect against ageing and various disease processes.
- Courgettes are a very good source of potassium, containing even more than bananas. Potassium is a heart-friendly electrolyte and helps reduce blood pressure and the heart rate by countering pressure-effects of sodium.
- Fresh courgette is rich in vitamin A and fresh pods are a good source of vitamin C. In addition, they contain moderate levels of B-complex group of vitamins like thiamin, pyridoxine, riboflavin and minerals like iron, manganese, phosphorus, and zinc.

Grow it yourself

Growing courgettes is easy, perhaps too easy. Sow the seeds in rows or hills, about 1 inch deep. The row spacing depends on the variety you are planting. In hills, plant four to five per hill and after they have germinated, keep the best two to three courgette plants. Water the first day and, if there is no rain, every two to three days until they germinate. Courgette plants like well-drained soil, but will grow in most soils.

We chuckle at the idea of adding fertiliser to such a prolific grower, but some soils are poor in nutrients. If your soil is poor, or if last year's crop was less than stellar, a side dressing of fertiliser and regular feedings of fertiliser will improve the health of the plant and the size of the harvest significantly.
Here's another tip for you: an individual plant can produce fruit right up until the first autumn frost. But, most plants lose their vigour, or fall victim to insect and plant disease. They can also spread right across your garden, with only the growing tip producing new fruits. We recommend a second planting right around the first of July. The second crop will be more vigorous and productive in the second half of the year than older plants.

When to pick

Courgettes are at their best during late spring and summer. The best size for picking courgettes is 4 – 5 inches long and 1.5-2 inches in diameter. Avoid overly mature, larger fruits, or those with pitted skin or a flabby or spongy texture. Furthermore, avoid those with soft and wrinkled ends as they indicate old stock and dehydration. Once picked, place the fruits in a plastic bag and store them inside the vegetable compartment of the refrigerator set with adequate moisture. They can be stored for up to 2-3 days.

Courgette blossoms are also an edible delicacy. In general, blossoms are picked during morning hours when they are fresh and soft. To prepare, open up blossoms and inspect them carefully for insects. Pull off any calyces attached firmly at the base.

Preparing to cook

Wash the fruits thoroughly in cold, running water just before cooking. Sometimes the fruits may require light scrub at places where dirt is attached firmly. Trim the neck and bases. Peeling courgettes is not recommended. Courgette plants are not hardy. They are susceptible to frost in the spring and autumn. They are also very susceptible to insects and disease. Fortunately, these prolific producers manage to produce a bountiful crop even so. If you plan to grow them, make sure your plans include how to use the large quantity you will have. And make those plans elaborate.
Like feeding your entire neighbourhood! •

FAST RECIPE

MARINATED **COURGETTE** AND YELLOW SQUASH SALAD

You can create this colourful salad just as fast as your courgettes grow. It'll be ready in just 15 minutes and you'll get an added kick of vitamin A from the fresh basil. Great tip: use the peeler lengthwise rather than horizontally to create long, beautiful green and yellow ribbons of squash.

This is what you need:
- **1/2 cup cider vinegar**
- **4 teaspoons sugar**
- **1/2 teaspoon salt, divided**
- **3 courgettes (about 1 1/2 pounds)**
- **2 yellow squash (about 3/4 pound)**
- **1 garlic clove, peeled**
- **1/2 cup packed fresh basil leaves**
- **1 tablespoon fresh lemon juice**
- **1 tablespoon extra-virgin olive oil**
- **11oz part-skim mozzarella cheese, cut into cubes**

Combine the vinegar, sugar, and 1/4 teaspoon salt until the sugar dissolves. Trim the ends of the courgette and squash; cut into thin ribbons with a harp-shaped peeler. Add to the vinegar mixture. Cover and chill for 2 hours or overnight.
Bring a small pan of water to the boil; add garlic. Remove with a slotted spoon after 1 minute. Rinse under cold water; set aside. Add the basil to the boiling water; immediately remove and rinse under cold water. Reserve 1 tablespoon of cooking liquid. Transfer garlic and basil to a food processor, and add lemon juice, olive oil, reserved water, and the remaining 1/4 teaspoon salt. Process until smooth.
Drain the squash, and divide among 4 plates. Top with cubed mozzarella, and drizzle with basil oil. Now take your time to enjoy. Not everything needs to happen as fast as a courgette.

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

I use your coco medium with your coco nutrients, CANNABOOST, CANNA RHIZOTONIC and CANNAZYM. I stick religiously to a pH between 5.8 and 6.0 and a EC shown in your nutrient schedule. Unfortunately, since I moved house (and therefore also changed my water supply), I have been having problems with nutrient deficiencies in my plants. My tap water EC is 0.1! I am not sure exactly what deficiency this is (or perhaps toxicity), because there may be several. Most likely is it a magnesium deficiency, but it is hard to tell. I have resorted to using another product which I hate having to do as I swear by CANNA. This product has magnesium and calcium but also iron and zinc and other elements that I probably don't need. The only way I can get it to work is by using it at full strength which adds a huge 0.7 EC onto my tap water, allowing me to run only a very low strength CANNA Coco A+B. I try to follow your online guide with 'normal feeding' and I have tried the other product at lower concentrations but to no avail. I have asked about the issue at hydro shops, looked up the water quality and I am still very confused. My main question is this: would your mononutrients be of any use to me and which ones?

Answer

Your water is very soft (EC 0.1). Normal tap water indeed contains calcium, magnesium and other metals like iron, zinc etc. You have three options to rectify this water deficiency:

1. Make it with mononutrients, or CalMag
- Add CaO15% EC + 0.4 (ci 7 ml/10 litre)
- Add MgO7% EC + 0.2 (ci 6 ml/ 10 litre)
- Add Iron (Fe) 2 ml/litre
- Add Tracemix 2 ml/litre

Photo courtesy of Gerald Holmes

2. Make it with CANNA COGr Buffer Agent. Although this product is made for buffering the COGr boards, it contains largely the same ingredients.
3. Add a higher EC with COCO A+B (heavy feeding + 0.2 extra). This nutrient contains a lot of calcium and magnesium, but also other elements. Most of the time you can solve the problem if you just increase the EC from the beginning. Prepared tap water is also a possibility, but you should give the normal dose with COCO A+B, because the total EC is high. If you use prepared tap water, you sometimes have to make the vegetative period longer (one day).

Question

Can I put a newly germinated seed straight into CANNA Terra Professional Plus (TPP) mix without killing it?

Answer

Yes, although CANNA Terra Seedmix is a better TERRA product for the germination of seeds. It keeps the seeds more moist and contains a low level of nutrients. Any nutrient level during the germination process brings down the success rate.

Question

I have been using your CANNA COGr nutrients with great results, but I am switching to a pure deep water culture (DWC) set-up soon and I was wondering which of your nutrient lines I should use. Would CANNA AQUA work for me?

Answer

CANNA AQUA is for recirculating systems in which the nutrient solution passes the roots quite often. In a DWC system, the roots sit in the same water. The buffer in AQUA nutrients in an aerated DWC system will push up the pH and be difficult to maintain. This means you can go on with the normal COGr nutrient as you would if you were continuing to use coco as a medium. Be very aware that a DWC system can be very wet and difficult to deal with. Ideally you would switch to an inert medium like sand or clay and then use the CANNA HYDRO line, which would provide a better ratio for inert material while avoiding the buffers that would push the pH up all the time.

Question

I am totally confused about how to transplant and go from a seedling tray to a harvest-able container using a good medium such as CANNA's TPP. When can this be done, how is it done, and how do I treat the containers?

Answer

Ending up with an engineered medium such as CANNA's Terra Professional Plus is very good, because it brings together a perfect combination of physical and chemical properties for a relatively long-term crop. But getting there involves a series of steps. Start out with a good seedling mixture, containing no fertility except what you provide at the right moment. Coco works, as does a pH-adjusted peat-based medium or inert medium. At the 2-leaf stage, transplant the plants into a small container such as a 1 or 2 inch pot of cell pack containing the TPP or the final medium. In these pre-charged mediums such as TPP, do not add any further additional nutrients but do water them in very well and ensure really good drainage (very important). A better option is a seedling mix for the next two weeks. After two weeks, the roots should extend to the outside of the medium and be ready for transplant into the next step. If the final home is a large 12 litre container or bigger, you will need to use intermediate container sizes to get there. From a seedling pot or plug to a 6 inch is really the max for most plant species but only if staying in a 6 inch. Going bigger means starting in a 4 inch after the seedling stage then moving up to 12 litre size maximum depending on how fast the plant grows, once the roots reach the outside again. Or go into a 8 litre size after the 4 inch until the roots reach the outside then up to a larger size of 19 litre or bigger. The plant does not slow down and has better relations with water when stepped up rather than being swamped in its new home. In all cases, after two weeks in the new medium, you should begin a fertility program. By the time you get to the final container, it should be ready for the fertility programme after one week in TPP.

Question

I am growing fruit in 12 litre buckets with twenty percent CANNA Aqua Clay Pebbles and 80% CANNA COCO, using a 24 auto pot system. In the past I used CANNA Aqua Vega and Flores, but I am wondering if I am using the correct food?

Answer

A coco substrate absorbs calcium, magnesium and nitrogen, but releases potassium and phosphorus. Although many growers think that an auto pot system is a recirculating system, it is often a one-way system in watering. CANNA COCO contains a lot of calcium and magnesium and in your system the coco substrate will 'eat' a little of the nutrient solution, but gives off phosphorus and potassium instead. That is why we only have COCO A+B for the whole cycle and not a separate Vega and Flores. The use of Aqua Vega and later on Aqua Flores can lead to an excess of potassium and phosphorus or a shortage of calcium, magnesium or nitrogen. The plant will start to yellow and later on it gives burned leaf edges and burned spots in the leaf.

Photo courtesy of Sigusto

Question

Does your BIOCANNA Bio Terra Plus or CANNA Terra Professional soils contain worm casts, chicken poop, horse dong, bone/blood meal or bat guano?

Answer

CANNA Terra Professional is TERRA feeded with mineral nutrients and lime, so the product does not contain any organic nutrients. BIOCANNA Bio Terra Plus contains organic ingredients like bone meal. This product contains no horse, chicken, cow or worm dung. Check www.biocanna.com for more info.

Question

I have a problem with snails and slugs eating the leaves on my plants and causing extensive damage. Can CANNACURE also control these pests?

Answer

No, CANNACURE cannot. These animals are too big and too strong. What you can do is to put some plates containing beer in your garden. The snails and slugs are attracted to yeast and will eventually drown in the beer. You can also buy some toxic granulates especially to kill snails and slugs at a grow store.

Don & Nicky

(PART 7)

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.

The slow PACE OF LIFE

Something just doesn't add up about the French. I call them, Monday to Friday during the legally sanctioned business hours of 9.30 to 11.50am, but it makes no difference. They never answer (and don't even entertain the idea of disturbing them during lunch—all three hours of it!). If their mobile phones have a mailbox facility, it's already chock-a-block full of messages from whiny Brits. Meanwhile life for French tradesmen appears to be one long siesta.

I don't give up that easily though. In fact, summoning the French to work has become somewhat of an obsession. Eventually, after weeks of continual badgering – enough to be classified as 'harassment' in most developed countries – a dishevelled, tobacco-scented man claiming to be a qualified plumber or electrician will begrudgingly turn up to take a sniff around the work on offer. Alas, no actual travaux will take place at this preliminary stage. Instead we are instructed to await the arrival of a formal written quotation -which, of course, never materialises. As a result our domestic situation has become so desperate that I've taken to watching instructional YouTube videos on plumbing. One thing's for sure: this ain't the good life!

We've been living in our new (but very old) house for a couple of months now. Long enough to take a peek at its bedsore-ridden underbelly and to reveal a few latent emergencies: a leaky roof, a dribbly toilet, a cantankerous garage door and some very dodgy electrics throughout. Welcome back to France.

My aspirations of acquiring a plasma grow light have already been consigned to the ever-thickening catalogue of naïve, discarded hopes and dreams. For now, what little money we have is demanded by more urgent projects. However my project to convert the wine cellar into an indoor garden has made some progress. I've created a framework for my room, had some extra plug sockets installed by a handy friend and created a ventilation system for my air-cooled grow lights, but there's still a lot more to be done.

The only growing that's taking place right now is inside a small grow tent under some high output T5 fluorescent lights.

Growing coriander (aka cilantro or Indian parsley) has been a learning experience. As my early tomato escapades will exemplify, I'm the kind of grower who tends to love his plants a little too much.

1 Converting the wine cellar into an indoor garden has made some progress, but the only growing that is taking place right now is inside a small grow tent.

2 My first harvest of coriander with a distinct lack of taste and without the 'wow factor'.

3 A Thai curry with some really pungent coriander leaves!

Photo courtesy of boymeetsgirlmeetsfood.com

In fact, I'm any gardening store's dream customer, always happy to try the latest potion, spray or powder in the tacit hope that it makes up for my lack of real growing experience

My multi-array T5 fluorescent fixture worked great, despite being a battered and bruised relic from a gardening trade show I helped out at several years ago. Its two 55-watt 6500K (daylight) lamps generated sufficient light and heat to germinate a flat of light potting mix infused with a generous scattering of coriander seeds. After two weeks I had produced a glorious 'afro' of leaves.

I routinely added a little liquid feed to my water and the foliage soon responded with a super lush, green colour and astoundingly fast growth rates. It wasn't too difficult to maintain cool temperatures with just two fluorescent tubes so the plants stayed in vegetative mode and didn't bolt and flower (something that happens all too often to outdoor coriander growers). After four weeks I was heartily congratulating myself on producing a veritable jungle of delicious looking cilantro ready for salsas, curries or just spicing up a salad. My first harvest of coriander leaves revealed my schoolboy error. Despite looking good enough for a seed catalogue, there was a distinct lack of taste and aroma. Sure, you could just about tell it wasn't parsley but the 'wow factor' was well and truly absent. I'd over-loved my plants, again!

I more or less gave up on the crop but Nicky kept it going by feeding it plain water. Fortunately the potting mix I'd used was very light (lots of coco coir) so, upon ceasing use of my liquid feed, the plants quickly depleted any residual nutrients lingering around the root zone and started to pale off. Two week's later Nicky surprised me by harvesting some really pungent leaves to garnish a Thai curry. Now paler and hungrier, the coriander finally tasted as it should! That very same evening, a much sought-after but infamously elusive plumber finally gave us a call back with a reasonable quote for plumbing in our dishwasher and fixing our leaks, despite my rather snotty message left two months earlier. Better yet, he was available the following Friday.

The adage: *'Treat them mean, keep them keen'* appears to hold true for French plumbers and my favourite culinary herb. Who knew? •

THE WAVE

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

- This impressive rock formation is called 'The Wave' and is part of the Coyote Buttes - a beautiful area in the Paria Canyon-Vermilion Cliffs Wilderness in northern Arizona. This wilderness covers 174 square miles and consists of wide plateaus, steep slopes and deep gorges.
- The Wave consists of U-shaped troughs which intersect one another. The two largest troughs are 62 by 118 and 7 to 52 feet.
- The Coyote Buttes consists of highly porous fossilised sand dunes made of red-coloured Navajo sandstone. A dinosaur 'trackway' or 'trample surface' was found in the area, showing that once many different types of dinosaurs live here.
- The sand dunes were formed by the wind and the different shades of red come from minerals and oxidants that penetrated the rocks via the groundwater.
- In order to protect the area, visitors have to walk carefully to avoid breaking the small ridges and the Bureau of Land Management (BLM) has said that only twenty people can visit The Wave per day. Half the admission tickets (costing £4 each) can be won through an internet lottery four months before the chosen date. The other half are allocated randomly on the spot. Your chances of winning a ticket are slightly higher if you choose to visit The Wave alone or in the period December - February.
- But finding The Wave may actually prove quite a challenge because there are no signs to point the way. This is to preserve the natural integrity of the area. Most hikers go out with a guide or GPS coordinates, directions and some photographs. What makes this trip even more challenging are the temperatures: 38 degrees Celsius and higher in the summer is no exception. There is hardly any shade and violent winds often create drifts of sand. If it rains, countless pools form that often remain for several days.

Photo courtesy of Nanouk el Gamal – Wijchers. www.photonook.net.

What's HAPPENING

Hard men with sharp axes and saws, a lot of sweat, impressive skills and massive trees being chopped down to the size of matches within minutes... These are the ingredients of timbersports. Consider yourself lucky you are not a tree. By Marco Barneveld, www.braindrain.nu

LUMBERJACK SPORTS

WATCH OUT FOR FLYING WOODCHIPS

Ready, set and goooooooo! At this signal, these massive men start pounding at massive trees to chop them to little pieces. Woodchips fly everywhere while the spectators support their favourite. Welcome to timbersports or woodsmen sports or lumberjack sports. Call it what you will, but it's a sport that you might well not have heard of yet, but which is gaining popularity by the day.

Oldest profession

It has probably been around longer than you might imagine. We've always needed wood, ever since way back in the days. People might say that prostitution is the oldest profession in the world but being a lumberjack might be even older. People have been chopping down trees since the beginning of history. In the old days in North America, long before the advent of mechanisation, lumberjacks would stay in logging camps all week cutting and hauling timber. These rugged outdoor men were usually paid by how much they produced

And when you put real men together, you get competition. Most men want to be king. Long before these competitions or bets were written down, they were already happening, that's one thing you can be sure of.

Axe-wielding gentlemen

The first wager that was written down did not take place in North America tough, but in Australia. In 1870, two fine wood-chopping gentlemen in Tasmania held a competition to see who was best. The first official competitions in North America date back to the 1920s. In the Basque region of Spain the first recorded competitions start in the 19th century.

These disputes eventually led to larger competitions at the logging camps to determine who was the best in each skill: from felling trees to bucking them with crosscut saws and, later on, who was best with a chainsaw. The best lodger from one camp then started to compete with the best of other lodging camps and, behold, a sport was born. Over time, the sport has grown into what it is today.

Rich history of forestry

One of the things that make lumberjack sports so unique is that almost all the different events in the sport are based on real tasks that lumberjacks or woodchoppers once performed at work. Without a doubt, this sport showcases the rich history of forestry from all over the world.

The way wood was chopped differs slightly from place to place. Depending on what part of the world you are in, you will find different types of competition.

Different places, different rules

In North America, the competitions are the most elaborate and feature a relatively balanced show including chopping, hand sawing and chain sawing. Some contests also feature wood-chopping water sports events such as boom-running and log-rolling because in North America the transport of timber was done by water in many cases. Other events that are common in the US and Canada are obstacle courses and pole-climbing disciplines.

North America is unique as it is the only place with collegiate competitions. Many colleges and universities with forestry programmes, and some without, have woodsmen or lumberjack teams. Most of these schools will host a competition every year.

Down Under in New Zealand and Australia, wood-chopping contests are held at many fairs and festivals. Although power and hand sawing is also done in competitions, wood chopping is the most common event. The axe men from Australia and New Zealand are some of the best woodchoppers in the world.

In the Basque Region of Spain, the competitions are endurance wood chopping races on hardwood logs. It is not uncommon for a competitor to have to cut more than three large Beech logs in succession. And let me tell you, if you have ever chopped some wood for your fireplace you know that you need a lot of strength and endurance to do this. All over Europe, the sport has been gaining popularity over the last ten years.

Marketing tool

This is largely due to the sponsorship of a chainsaw producer, which uses lumberjack sports as a marketing tool to brand their name. This producer hosts Timbersports Series competitions and training camps in various countries. The Timbersports Series assembles the world's top lumberjack athletes to compete in the Original Extreme Sport. The Series is watched by over 20 million viewers annually in over 62 countries around the world on networks like Eurosport and The Outdoor Channel.

Check out the internet to find a spot where you can work on your inner lumberjack and start chipping wood. Ready, set and gooooo! •

More information

If you want to know more about lumberjack sports, a good place to start at is www.lumberjackworldchampionships.com. •

Disciplines of lumberjack sports

The variety of disciplines of woodsmen competition varies all over the world. Here are four of the disciplines you may run into:

Hot saw

In this discipline, the competitor uses a customised chain saw with a modified engine, usually taken from a personal watercraft or snowmobile.

At the signal, the competitor starts the saw and makes three cuts. With only six inches of wood to work with, precision is key. If the competitor saws outside of the designated six inches or fails to saw a complete 'cookie' (term used to describe the circular piece of sawn-off wood), he will be disqualified.

Single buck

The competitor makes one cut through 19 inches of white pine using a single-man cross-cut saw. The competitor may have a helper wedge his cut into the log to prevent the saw teeth from sticking. The time ends when the block is clearly severed. The primary challenges of this event are technique, brute strength and stamina. The single buck is referred to as the 'misery whip' because of the physical toll a body endures while using it.

Standing block chop

Mimicking the felling of a tree, the competitor races to chop through 12 to 14 inches of vertical white pine. The competitor must chop from both sides of the log. The time ends when the block is severed. Precision is the key to success in this event. Stamina is the primary challenge because this is one of the most physically exhausting events.

Underhand chop

The competitor stands with feet apart on a 12- to 14-inch white pine log. At the signal, he begins to chop through the log with his racing axe. Before chopping all the way through, he must turn and complete the cut from the other side. The time ends when the log is severed completely. The challenge in this event is precision, as well as the location of the cuts.

SNAILS & SLUGS

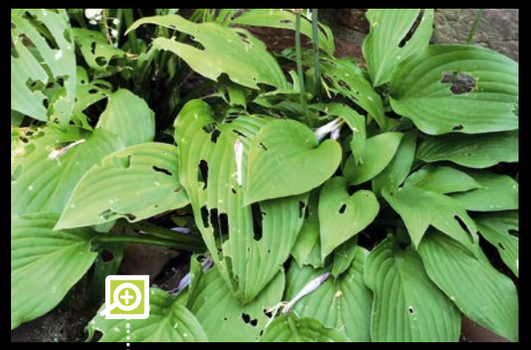


Figure 7: Damage caused by snails or slugs

Photo courtesy of Toby Cyphart

Figure 8: Buried jars filled with beer is a natural remedie against snails and slugs.

Figure 9: Slug eggs

Land snails and slugs are gastropods that have adapted to terrestrial life; most belong to the subclass Pulmonata. One of their characteristics is respiration by means of a breathing pore (pneumostome) that communicates with the lung. In snails this orifice is situated within the shell, and in slugs it is together with a hardened structure behind the head. By Ignacio Garcia, CANNA Research

Snails have a hard shell which serves as protection and into which they can retract when threatened. There is a wide range of sizes; the smallest is 0.04 inches long and the largest, the giant African snail, may reach 12 inches. They secrete mucus or slime which allows them to keep their bodies humid and to move along a surface. They feed using the radula, the equivalent to a tongue, which has a row of small teeth with which they rasp the plants they eat. The head has two eyes on the end of a pair of retractable tentacles. They also have a pair of retractable sensory tentacles. These animals are hermaphrodite, but do need another individual to reproduce. When conditions are unfavourable or at times of maximum sunlight they usually take refuge under rocks or in cracks in the soil.

Slugs are characterised by the lack of the shell; as with snails they secrete a mucus which protects them from desiccation and allows them to move. They are cylindrical in shape and may be as long as 4 inches. They also have four tentacles. They need a humid environment to develop and are usually nocturnal. During dry periods they burrow into the soil, where they remain inactive. Slugs are also hermaphroditic and require another individual to mate; they lay between 20 and 100 eggs which are stuck together with a mucus secretion. Eggs may be deposited on the soil surface if there is adequate humidity or buried under decomposing material or rocks. These molluscs feed on stems and tender leaves (although there are carnivorous species which feed on other snails and slugs), so recently germinated seedlings and plants with an herbaceous stem are the most vulnerable.

Biological cycle

Snails

Eggs are usually laid on the leaves of native plants or buried; they hatch after about 7-14 days of incubation.

It usually takes several months for recently born snails to develop into adults, during which time they are fertile and can lay eggs - several thousand in a month. Depending on the environmental conditions, an adult may live from 5 to 25 years. In cold seasons snails remain dormant inside their shell, sealing its opening.

Slugs

Eggs may remain torpid for up to 6 months in dry environments. Slugs reach adulthood around 2 to 5 months after hatching. They also hibernate; a number of individuals may be found grouped together in the soil or under rocks.

Control measures

Chemical control

The product most utilised to control these pests is metaldehyde, a chemical substance that acts both by contact and by ingestion. However, this product is quite toxic for mammals, either when inhaled or ingested.

Natural remedies

The strategy most used to combat these molluscs is to use bait or products that repel individuals from trying to enter the crop. Widely used methods include:

- A border of ashes or wood with iron sulphate around plants that need protection. When snails and slugs come in contact with these products, their interaction with the mucus membranes produces a reaction that drives them away.
- Buried jars (cylinders) at the level of the ground filled with beer. Snails and slugs are attracted by beer, and when they reach the jar and enter it, they become trapped and drown.
- Pick up slugs at dawn, when they are already on the plants, and drown them in water.

Biological control

Although it is not usually introduced intentionally by people, some insects such as ants eat snail and slug eggs. A number of bird species also consume the adults. Other animals that eat these molluscs include snakes, hedgehogs and toads. The nematode Phasmarhabditis hermaphrodita is commercially available as an biological protection against slugs.

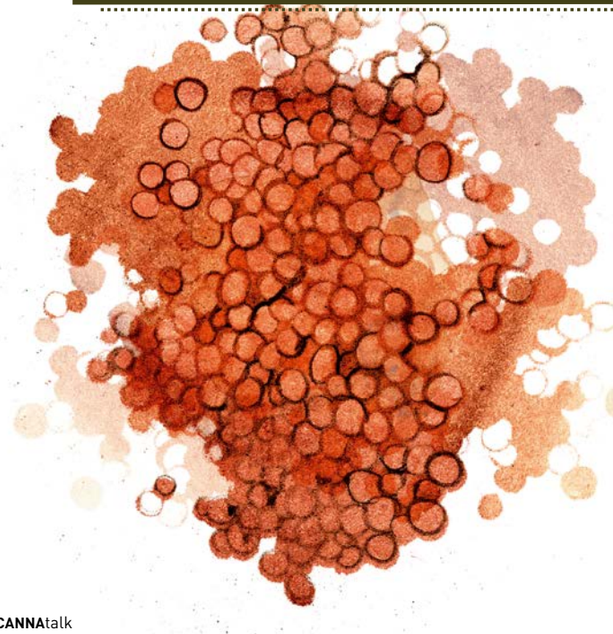
Cultural measures

You should remove weeds close to the crop, as well as organic residues and rocks, since these are provide places where the slugs and snails can take refuge and lay their eggs. •

GROWING MEDIUM DESIGN BASICS

MOST PEOPLE SPEND THEIR LIVES TRYING TO POSITION THEMSELVES IN SITUATIONS THAT ARE CONDUCIVE TO ACHIEVING SOMETHING THEY WANT. BY MAKING CERTAIN CHOICES, WE TRY TO ESTABLISH A SUITABLE ENVIRONMENT TO GIVE US THE BEST OPPORTUNITY FOR ACHIEVING A SPECIFIC GOAL. THERE IS NO GUARANTEE OF SUCCESS, WE CAN ONLY MAXIMISE OUR CHANCE OF ACHIEVING SUCCESS. THE SAME APPLIES WHEN SELECTING VARIABLES IN AGRICULTURE. THIS COULD BE CHOOSING A CROP BASED ON OUR LOCATION, CHOOSING THE LOCATION BASED ON THE CROP, OR - THE POINT OF THIS ARTICLE - CHOOSING THE RIGHT GROWING MEDIUM IN WHICH TO PRODUCE THE CROP.

By Geary Coogler, BSc Horticulture, CANNA Research



All plants evolve under a certain set of conditions, known as a range, through natural selection or active breeding programmes. These conditions include all external variables such as temperature, light, fertility, water quality, water frequency, and the ability to propagate. There are two main parts of a plant, the top or vegetative part, and the bottom or root zone. In effect, there is an evolution in both parts; while the top evolves to handle, say, the high amounts of light, warm temperatures, and humid conditions that exist in a band around the middle of the earth near the equator, the roots may have evolved to cope with restricted air space, poor fertility, and a specific ratio of nutritional elements that is unique to specific areas. When man only grew crops native to these conditions, growing outdoors in soil or another natural medium was best as it met the needs of both parts of the plant. With the advent of soilless growing mediums, man has been able to expand the range of plant species that may not do as well in natural conditions. These products can be designed to meet the needs of the root systems in locations that would not normally be able to.

In the previous article in this edition of CANNAtalk on page 4, 'What is a good-quality growing medium?', a set of characteristics was given that can meet these requirements. These characteristics vary greatly, depending on the crop and the conditions under which the medium will be used. There are, nonetheless, the specific characteristics to match to the crop and the conditions that they are to be used under, in order to achieve optimal results.

What to look for

Growing media are chosen on the basis of many factors including the crop, the location, the availability of the medium, the suitability of the medium, the level of care that can be given, the environment, the watering system, and profitability (either monetary or the yield achieved) - to name a few things.

Good growers never make a choice based on what someone told them. They base their decisions on reality and knowledge. They understand what they, the grower, can provide, what the plant and crop need, and what is possible given the prevailing conditions. The basic foundation is the growing medium and it has to do certain things at the level that the crop can work with.

A good growing medium, as mentioned before and as common sense dictates, should provide:

1. Support – Physical support to allow the roots to grow downwards and the top upwards, anchoring the plant firmly and providing a platform in which a plant can develop. This also provides the means of achieving the next three characteristics.

2. Regulation of water availability – In a container, the water table is different from native soils, water must be allowed to flow through fast enough that the roots do not drown, yet retain enough to buffer the plant's need for water. It is the ratio of air to water to particles that determines water retention capacity and affects how much swelling and shrinking the medium will do. Nutrients move through a mass flow in the soil solution to the roots where they can be taken up into the plant. Roots grow in response to the slowing of this movement. A limited event horizon limits movement against gravity (capillary) and must be compensated for.

3. Nutrient reservoir – Plants use and take up nutrient ions all the time, not just at the moment they are fed, and so they require a continuous source of these ions in the correct ratio, at all times. These ions must have a place to 'park' until needed – this is referred to as 'availability'. Like any assembly line, having parts staged so they are available when needed makes for smooth functioning. Periodic feeding means periods when nutrient concentrations fall below what is needed while at other times levels border on being toxic. Constant feeding is the ideal since it shortens

Figure 10: Physical support, regulate water availability, nutrient reservoir and a healthy environment are the four characteristics of a good medium. The other terms affect these characteristics and are key specifications that the grower needs to be aware of.

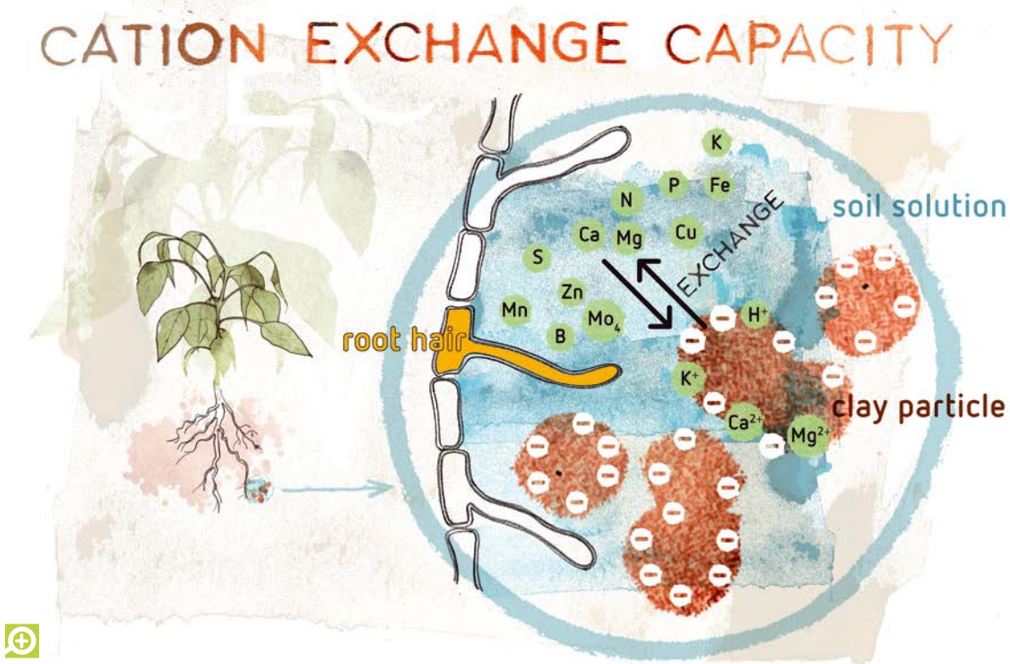


Figure 11: Cation exchange capacity (CEC) is the ability of soil to store and exchange nutrients. Soils with a high content of clay or organic matter have a high CEC. This is because clay and organic matter are negatively charged which attract and hold positively charged ions, including plant nutrients.

Photo courtesy of Scot Nelson

Figure 12: The chemical balance of a soilless medium is important to avoid issues like blossom end rot and to achieve proper taste characteristics.

these periods while decreasing the highs and lows. Cation exchange capacity (CEC) serves this purpose, if available.

4. A healthy environment - Not only does this mean clean and pest free, it also means providing the environment that the plant's roots need to function and includes porosity, air/water (large/ small) pore ratios, chemical balance in nutrient ratios, pH levels, uniformity, consistency, and low overall salt content (EC, TDS).

There are a few key specifications that the grower really needs to be aware of and how they affect these four characteristics of a good medium. Those specifications include bulk density, porosity, air/water pore ratio, the chemical profile, CEC and uniformity/consistency. Based on the crop being grown, the conditions, and the care given by the grower, these factors can be adjusted in the medium like tuning up an engine in a car.

One important thing to note here is that plants always have a medium they evolved in. The further away from this medium the soilless option is, the greater the risks and the greater the level of care the grower will have to provide. The choice of growing medium can sometimes affect the end results during harvesting or marketing. Soilless mediums should fit the needs of both the grower and the growing environment, and should deliver these results consistently, time and again.

Design a soilless medium

When examining a well-defined medium such as CANNA Terra Professional Plus (TPP) for use with a given crop, tomato for instance but the same applies with any other crop, the first choice to make is in the base substrate: will it be water, organic, rock wool, etc? Tomato grows well in all these media, but if we apply the first rule - that the further away from soil, the more difficult growing becomes – we can see that it will require much more effort to grow in water, than in rock or sand, which will in turn be more difficult than organic substrates. The term is 'forgiveness' (or buffer). This refers to the degree to which the grower can leave the crop unattended during the growing cycle. The more variables involved, the more technical ability is required to produce a passable fruit.

The tomato is a fast grower, heavy fruiter, that needs its water but control of that moisture is essential to avoid fruit split and other water logging issues; good porosity is needed with good air space in the ratio. Also, chemical balance is important to avoid issues like blossom end rot and to achieve proper taste characteristics. Currently, peat is the preferred soilless medium to grow tomatoes in. In addition to good porosity, it has a density large enough to support the plant yet light enough to be easy to handle. It is clean and can be treated to balance the ratio of elements as well as the pH. It provides an acceptable CEC for a good buffer against nutritional swings, and can be physically engineered to give just the right air space to 1) not drown the plant when it is new, and 2) not require continuous irrigation later in the crop cycle just to keep the plants from wilting. All these properties add up to a soilless medium that is hard to match in terms of availability, function, adjustability, cost, and consistency by grade, at least for short growing seasons. Coco offers some advantages over peat, but it requires a little more attention to detail (more grower hands-on time), while peat is a little more forgiving. Coco is, however, an excellent amendment for peat in a decent potting mix. When it is a high-quality coco that has been washed and treated properly, it will add some chemical qualities to the peat as well as water retention capacity and porosity. It also adds its own form of CEC, and (being slower to break down) continues to provide these benefits for the entire lifetime of the peat. The original 'peat lite' mix, developed at Cornell University contained perlite, a heat expanded rock in a 1:1 ratio (peat to perlite), arguably started the soilless revolution in the green industry, but its drawbacks are numerous. These include the energy required to produce perlite, the possible contamination, dust, and the longevity it has as a waste product. Cost is always a concern and research is constantly looking for new, better and cheaper ingredients.

Perlite and coco are added to modify a very important attribute of the peat, the physical properties. Soil-based mediums are judged according to particle size. These sizes affect the texture of the medium leading to a term known as friability or the ability of the medium to form aggregates or clumps. The difference in size leads to basic porosity, with large particles generally forming larger pores (spaces that normally hold air when the water drains away under gravity) and smaller particles form smaller pores (spaces that retain water against gravity); mixing the two produces a ratio of small to large. CEC populate the surface of these particles as well so it is important to provide enough to allow for smoothness in the nutrition a plant has access to. The addition of other elements such as organic materials provides not only a nutrient base but a glue that binds the particles together to form larger clumps that provide friability or a looseness to the medium. The nature of this soilless medium, Terra Professional Plus, is judged in the same way; however, this is achieved differently through the structure of the base material and amendments.

There has to be a certain amount of porosity for the medium to work with plant roots. It is equally important that there be a balance in the ratio of small to large particles because too many small pores will drown the roots and too many large spaces (air) results in the loss of too much water to support the plant root system. High-quality bulk mixes factor in

Figure 13: **Peat is the preferred soilless medium to grow tomatoes in. It has a density large enough to support the plants yet light enough to be easy to handle. Furthermore it is clean, it provides an acceptable CEC and can be physically engineered.**

these needs and provide a basic textural structure, but that requires the grower to make chemical adjustments to suit the crop being grown and the growing environment that the grower will provide. This ratio of small to large spaces is what regulates the flow of water through the medium.
Water moves downwards with gravity and laterally with capillary action through the smaller pores; if there are too many small pores, drainage will be slower and the water will remain in the air spaces in the medium longer, effectively drowning the roots. When there are too few small spaces, lateral movement (mass flow to the root surface) will slow down and water uptake by the plant will decrease. This is a critical distinction to make as it is may make it difficult for the grower to maintain the level of water in a given system. It is also possible to have pores that are too small and lock away the water, or pores that are too large and limit root growth, which is why the pores are counted.

So porosity affects many things and the pores of the soil are also where the chemical attributes of the medium are found. The nutrients that are dissolved in the soil moisture as ions or adhere to the particles or CEC sites, the location of microbial function, and the buffer against water deprivation and fertility are all governed by porosity. They also affect bulk density providing the looseness and strength to support a plant.

The material itself, through composition and degradation, affects the pH which reaches a level based on the content of the water available for the plant. The correct balance between all these things, as they relate to the plant and situation, affect the overall health of the growing medium. The chemistry of the medium will mean that the levels of nutritive ions are correctly suited to the crop. The medium will contain these ions in the correct proportions and form so that they are available to the plant. They will also be adjusted using the correct products that minimise the antagonisms that some ions have with each other by containing the correct ratios of substances like calcium to phosphates to potassium and so on. Even the ratio of non-nutritive ions such as sodium must be monitored (Sodium Adsorption Ratio – SAR) to prevent them from destroying the texture and functioning of the medium.
A good medium, in this case TPP, will start with clean materials, designed to provide the optimum physical and chemical characteristics in all respects. In addition, it will have the chemical characteristics to provide a proper starting ratio for growing, a starting level of fertility as well as a long-term fertility buffer, and it will provide the right pH for growing for as long as possible when limes are added. In short, a good medium is designed and engineered to provide the optimum growing environment for the chosen crop.

In the end, there is no magic, and you need to do more than just throw materials together. Growing media have a purpose and there is a reason for using or avoiding them. Which growing medium is right for a grower is up to the grower to decide. Understanding how all these things interact in the situation and with the desired crop is the only way for the grower ever to be consistent in providing the best situation to achieve success. Knowing is growing and understanding the basics of a good medium will enable him to make the best choice possible. •

Grower's TIP #26

By your friend SEZ

THE PH OF YOUR GROWING MEDIUM

pH has always been a huge attention grabber among the high-tech gardening crowd.

Its importance and significance have probably been discussed (and exaggerated!) more than any other aspect of horticulture. Yet somehow, one factor of pH has been left out, ignored and almost totally neglected: "The growing medium determines the pH of the nutrient solution it contains". Unless, that is, you are growing using highly inert and sterile materials.

Setting the pH of the nutrient solution correctly is not a bad thing. However, if you are growing in peat-based professional-grade soilless mixes, coco or real soil, the pH of the growing medium will have much more influence on what your roots will 'experience' than the nutrient solution you apply, which under normal circumstances will have a limited and short-lived influence on the pH of the medium. And there is no guarantee that the pH of the growing medium will be the same as that of your nutrient solution.

Professional manufacturers of potting soils take into account the physical and chemical characteristics of every component in order to create the right pH for growing over the whole growing cycle of the crop that the mix is designed for. Some lower-quality soilless mixes, if not modified, may not be suitable for certain type of cultures. However, the high-quality mixes should not be modified or supplemented in any way in order to ensure easy and successful growing.

When a grower decides to add components to a professional-grade growing medium, he is likely to change many more things than he might realise. On top of the changes in the water/air ratio, by adding inert materials, some additives like composts may change the pH value of the growing medium, they can also increase the overall EC, change the cationic exchange capacity (CEC), the carbon to nitrogen ratio (C:N) and many other properties. All these factors have much more influence on the growing performance than the discrepancy of a few pH points that your pH meter may show when you adjust the nutrient solution.

Of course, many of the problems that are attributed to suboptimal pH by online newsgroup 'specialists' often have a very simple cause... cold water. Growing mediums are easy to cool down but hard to warm up. Use a thermometer to check whether yours is at the right temperature, then proceed to a full medium analysis if you think it really is pH related. •

Puzzle&WIN

We know... you guys just can't get enough of this old favourite! So especially for you, we have a new Sudoku puzzle – not too hard, but certainly not too easy either. Never done a Sudoku before? Here's what to do: each row, column and 3 x 3 grid must contain all the numbers between one and nine, once only.

WIN A SET OF **CANNA AQUA FLORES** AND **AQUA VEGA**

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

Great PRIZES

So get your brains working out those numbers, and don't forget to let us know what your solution is (sending the middle part of the puzzle is enough for us to check) and maybe

YOU will be the lucky one who wins a set of CANNA Aqua Flores and Aqua Vega

Winner ~~puzzle#24~~

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

Adam Robb.

Congratulations on your set of CANNA Mononutrients.
We will contact you as soon as possible to organise the dispatch of your prize.

WHAT'S NEXT

The research articles in CANNAtalk 27 will be about plant growth regulators, followed by a very practical Grower's Tip about this interesting subject. In this issue you will also find recurrent articles like Don and Nicky (for those who would like to know how his coriander is growing), Pests and Diseases (for those who would like to know how to recognise mildew and how to prevent it) and a Grow it Yourself about kohlrabi. The What's Happening is about fancy hot rods and is the true eye-catcher of this issue, as well as the Factographic. So don't miss CANNAtalk 27!

DON'T MISS IT!

CANNAtalk is your 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 2014. I've secretly enclosed 10 pounds in this envelope to pay for it.

Solution to the puzzle:

#26

CANNAtalk

SERIOUS GROWERS

CANNAtalk:

- Is published by CANNA BV, a company dedicated to finding the best solutions for growth and bloom.
- Is distributed through local UK retailers and wholesalers.

Editor: Karin Brinkman
E-mail: info@CANNAtalk.com
Phone UK office: 0870 240 2991
Printed by: Koninklijke Drukkerij E.M. De Jong

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#26

CANNA additives; Getting you to the top

CANNA additives

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www.canna-uk.com

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Thé solution for growth and bloom