

CANNAtalk[®]

MAGAZINE FOR SERIOUS GROWERS

ISSUE 13 2011

BOTRYTIS

Infectious crop
killer



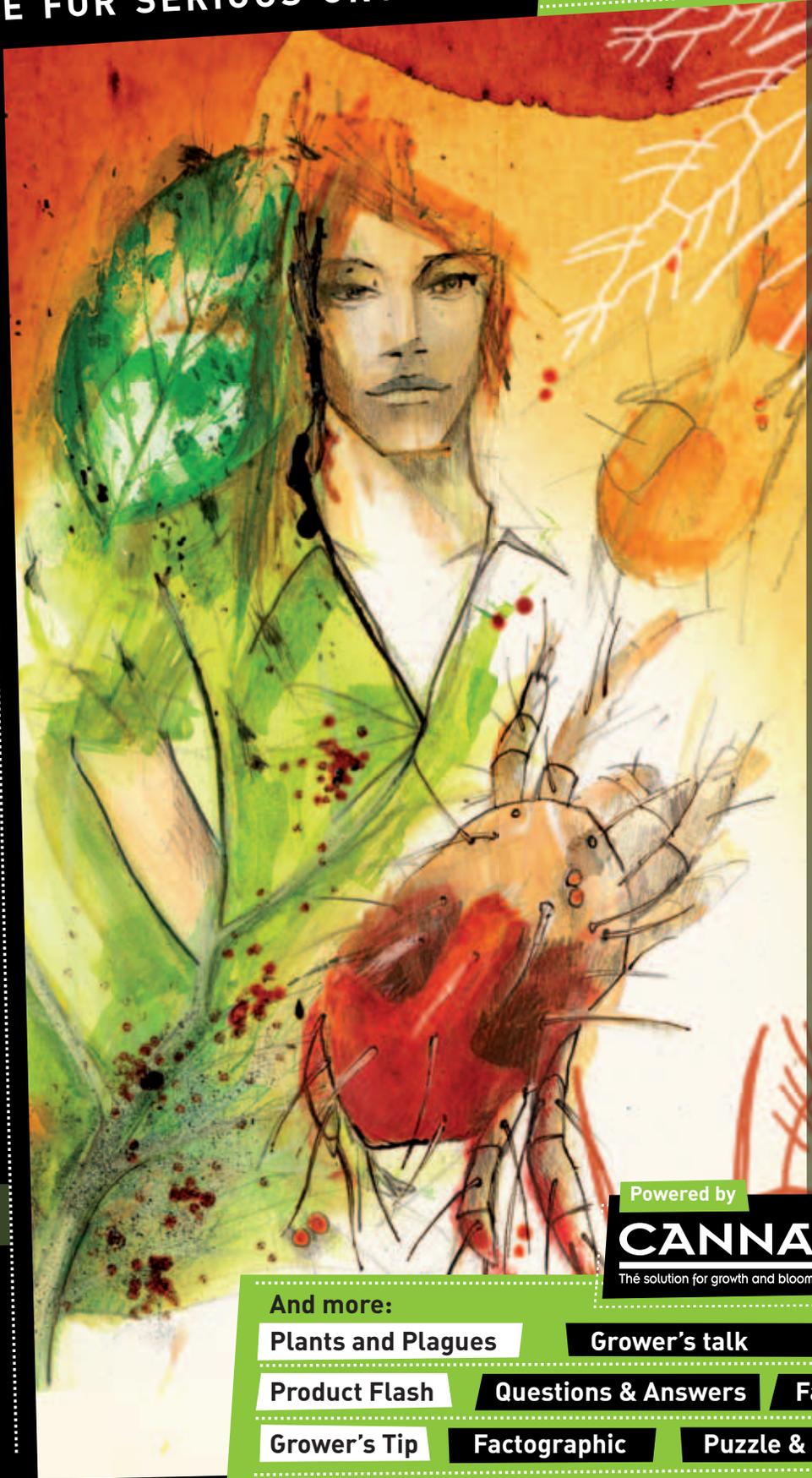
Graffiti

Art should be
a crime



GINGER

The miracle spice



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Plants and Plagues

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HOTalk:

Triskaidekaphobia... A term made up of Greek words and meaning Fear of the number 13. Thirteen, a mystical number to many and often seen as a number of misfortune and bad luck. Friday the 13th is a world known myth. In Tarot cards, number 13 is the card of death, Apollo 13 wasn't the luckiest mission to the moon. Lots of hotels don't even have a 13th floor or rooms with this number. Would number 13 really be that bad?

This is our 13th issue of CANNAtalk. A number to dedicate this issue's theme to one of the most feared tragedies in growing... Pests and Diseases. It is what every grower is afraid of and it can ruin your harvest. Everyone eventually will face one of the numerous pests and disease problems sooner or later while growing. Don't let it get you down! Don't be afraid! Fear has to be looked at in the eye! And CANNAtalk is here to help you out. We have two interesting Research articles regarding this theme. The first explains the most common pathogens like fungi, bacteria, protists and viruses. The second article focuses on a mold many growers get to face... Botrytis. Then there's a growers tip on page 23 to complete this issue's theme.

Graffiti is another thing that is seen by some people as a pest. It perfectly fits this issue's theme in the "What's happening?" section on page 20 you can read about this interesting and somewhat rebellious form of art.

You'll also find something new in this issue of CANNAtalk: CANNA Start! It's our latest innovation and really adds something valuable to our current range of products. Check it out in the product section on page 28.

We are always curious to hear what you think of CANNAtalk. So any remark concerning this or other editions can be addressed to editor@cannatalk.com. Or you can always submit your (growing) questions through our website www.canna-hydroponics.com.

Superstition or not, number 13 is a mystical number. We hope that our 13th issue will be of help to you and you'll find there are good things about the number 13. At least we are proud of this 13th issue and call it... Lucky 13!

Enjoy reading!
Jeroen

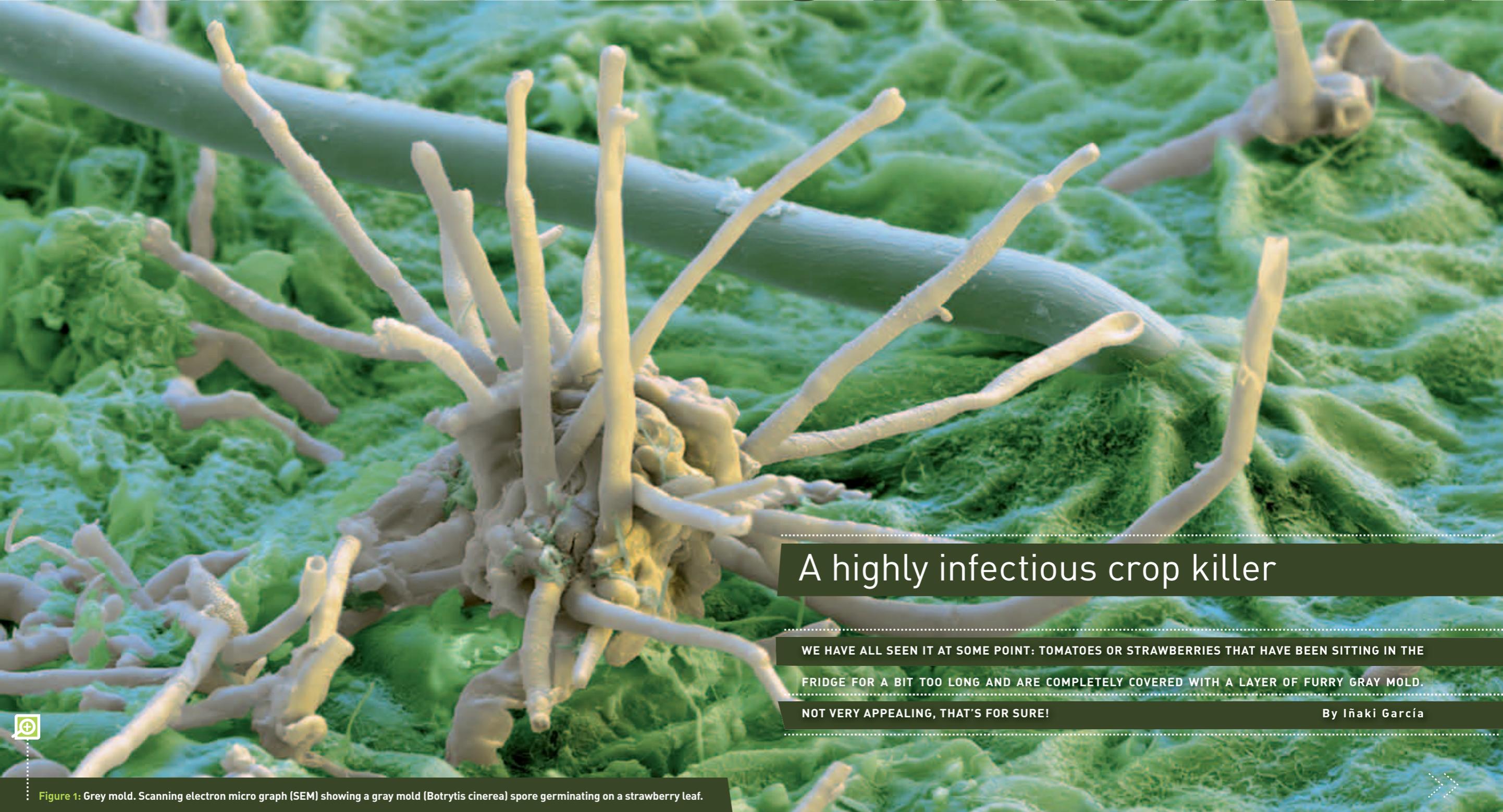
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(GRAY MOLD)

BOTRYTISCINEREA



A highly infectious crop killer

WE HAVE ALL SEEN IT AT SOME POINT: TOMATOES OR STRAWBERRIES THAT HAVE BEEN SITTING IN THE FRIDGE FOR A BIT TOO LONG AND ARE COMPLETELY COVERED WITH A LAYER OF FURRY GRAY MOLD.

NOT VERY APPEALING, THAT'S FOR SURE!

By Iñaki García

Figure 1: Grey mold. Scanning electron micro graph (SEM) showing a gray mold (Botrytis cinerea) spore germinating on a strawberry leaf.



BOTRYTISCINEREA

Figure 2: Moldy grapes. View of gray mold (*Botrytis cinerea*) growing on a bunch of grapes (*Vitis vinifera*). Grey mold of this type is among the most common molds to affect plants, and is a serious economic problem. It affects several types of crop, in particular tomatoes and other soft fruits like strawberries, raspberries and grapes. It also affects stored crops such as onions, bulbs and tubers. Stored produce can be protected by ensuring the storage environment is adequately heated, but also cool and dry. Living plants can be protected by the use of chemical fungicides, but the mold often develops a resistance to these.

word 'cinerea', referring to the ashy color of the mold. Viewed under a microscope, using a little imagination, the structures carrying the fungal spores do indeed look like bunches of grapes. *Botrytis cinerea* is a necrotrophic fungus, which means that it kills its host to obtain all the nutrients it needs. The tissue on which it develops becomes dark and sometimes soft, due to the death of the host cells. In time, a layer of furry gray mold will form on these dark spots. The mold grows on dying and dead plant material but can also affect living cells. Usually, a *Botrytis* infection only becomes visible after

two or three weeks. If the infection can be seen with the naked eye, the mold will already have penetrated the plant. At that point, there is little point in using a fungicide. The fungus can infect over 200 plant species, but it causes the most damage and yield loss in strawberries and grapes. It is also saprophytic: it can feed on non-living organic debris. This means that it can also affect crops that have already been harvested! *Botrytis* prefers flowers and fruits, but it can also grow on stalks, leaves and seeds. Infected seeds carry the fungus, which only starts to grow and develop when conditions



Frequently, the mold that we are seeing is *Botrytis cinerea*, also known as gray mold or gray rot. This parasitic mold sends shivers down the spine of many growers. It can occur in flowers and fruits, particularly at the end of the flowering or fruit-ripening period and mainly in outdoor crops that are exposed to rain and humidity. *Botrytis* attacks weak plants or dying flowers. In fact, in nature it helps the recycling process of plants by breaking them down and making the nutrients available in the soil. So the fungus actually plays a vital role in the natural growth cycle. But when it strikes your crops, it's a pest!

The organism causes significant loss of crops every year around the world and as such it represents a threat to our food supply. The mold is particularly likely to attack in the autumn, but it can also strike during wet summers. This is because *Botrytis* thrives under conditions of high air humidity. This is a very good reason for not keeping your fruit and vegetables in the fridge, because after all, your fridge is very humid!

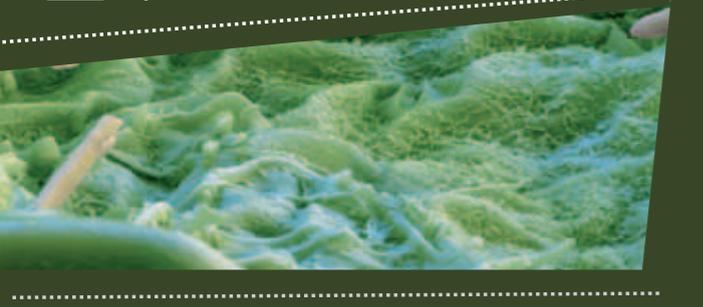
Grapes

The name 'gray mold' refers to a phase in the development of the fungus, during which it acquires the appearance of a gray fuzz. This fuzz contains the spores (reproductive cells) of the fungus. The typical fuzz is rarely observed, since it requires specific conditions to produce spores.

The species name *Botrytis cinerea* is derived from the Greek word 'botrys', which means 'cluster of grapes' and the Latin



Figure 3: Light micro graph of spore masses of *Botrytis cinerea*. This fungus is also called *Botrytis* rot. It produces millions of spores (gray masses) at the end of branched conidiophores (gray filaments). The spores are easily dislodged, carrying the infection rapidly from plant to plant.



BOTRYTIS CINEREA

are suitable. This usually happens when the seed is germinating. When this happens, the seedling will die shortly after germination or the seed will not germinate at all. This effect is known as 'damping off'. It can also be caused by other germs.

The fungus infection in flowers is not visible initially. Chlorosis – tissue that looks brown and wet near the infection site – is one of the first symptoms that indicate a possible Botrytis attack. A lighter colored spot on the flowers with a dark brown ring around it can also indicate a mold infection.

Life cycle

Early development of gray mold usually starts in infected plant debris from previous crops, which have been left in the field. The mycelium present in the debris begins to develop when temperatures increase, for example in early spring. In bright light, the mycelium begins to produce structures called conidiophores. At the end of these conidiophores, spores called conidia are formed which are then transported through the air and can come into contact with the leaves or stem of crops. There, they germinate and begin to attack. A sudden drop in humidity and a temperature increase is necessary for the spores to be released from the conidiophores. This is usually the case during early morning. Raindrops splashing on an infected plant can also contribute to the dissemination of the spores. Insects are another means by which the conidia can be carried from one infected plant to another, and they are a major source of infection. Other sources that can cause infection are nearby crops and gardens which are infected.

For the spore to germinate, sufficient moisture and nutrients (sugars and organic materials) must be available on or around the plant. Moisture can come from condensation on the plants, which is caused by air humidity levels of over 95%, or from any plant sap which is escaping as a result of damage to the outer surface of the plant. When a spore germinates, germ tubes emerge from the spore. At the end of these tubes there is a widening, called an appressoria, which forms an infection peg that enters the plant tissue. The peg is not able to penetrate the plant tissue instantly. It first needs to secrete certain enzymes, which help to eliminate the plant's first cellular barrier (the cuticle - the waxy outermost layer of the plant). The cuticle of healthy tissue is often very tough, so the fungus is more likely to penetrate damaged, weak or senescent (aging) tissue. Infection can also start through stomata and wounds. That is why Botrytis often appears after an attack by caterpillars, because the fungus will take advantage of the damage caused by the insect bites to enter the plant.

Any damage that has been caused by the grower when making cuttings, harvesting fruit or pinching out growth tips, can also give Botrytis an opportunity to enter the plant. Once it has penetrated through the cuticle, the fungus can spread to the next layer of cells, which are rich in pectin. To do this, the fungus secretes more enzymes, different from those used to remove the cuticle. Such enzymes are pectinases, including endopolygalacturonase. The optimum temperature for fungal growth is around 75°F, but it can withstand temperatures as low as 30°F. So actually, temperature plays a less important role than relative air humidity. As long as the relative air humidity is high, Botrytis can attack in all temperatures.

Botrytis also secretes proteins and phytotoxic substances that trigger the collapse and death of cells adjacent to the host. One of these substances is called botrydial.

The plant's immune system also affects the speed at which infection occurs. The plant's defenses are sometimes lower in the autumn, which means that the half-dormant Botrytis can severely strike the plant. This is why some growers have problems with Botrytis at the end of the growing season. But higher levels of air humidity often play an equally important role in this phenomenon.

Control methods

During cultivation

It is very important to get rid of any parts of the plant that are infected with Botrytis. The infected parts should be removed and immediately put in a plastic bag. If you need to remove the whole plant, you should follow these steps: first, put a bag over the plant without touching it. Then take the plant out of the ground, including the roots. After that, remove the bag and the plant from the growing area. Before you go back to the growing area, wash your hands and change your clothes. You must never allow the infected plant or parts of the plant to come into contact with other plants, because even the slightest contact will send clouds of gray spores into the air. These spores will then land on healthy plants which may then get infected.

As for the crop, it is important that the plants have enough space and that the leaves do not touch each other. Good ventilation is essential in order to maintain slightly lower humidity around the leaves and flowers. For outdoor crops, it is advisable to cover the plants with a plastic shelter like a poly-tunnel when rain is expected. This prevents the plant from getting wet.

It is also important to be vigilant against pests such as caterpillars which can cause damage to the cuticle, which allows B. cinerea can exploit to enter the plant more easily. It's easier for the fungus to infect plants that have been damaged by chewing pests. Other insects like thrips can carry and spread Botrytis spores.

Biological control

Several micro-organisms have proven to be successful in controlling B. cinerea in a wide variety of crops.

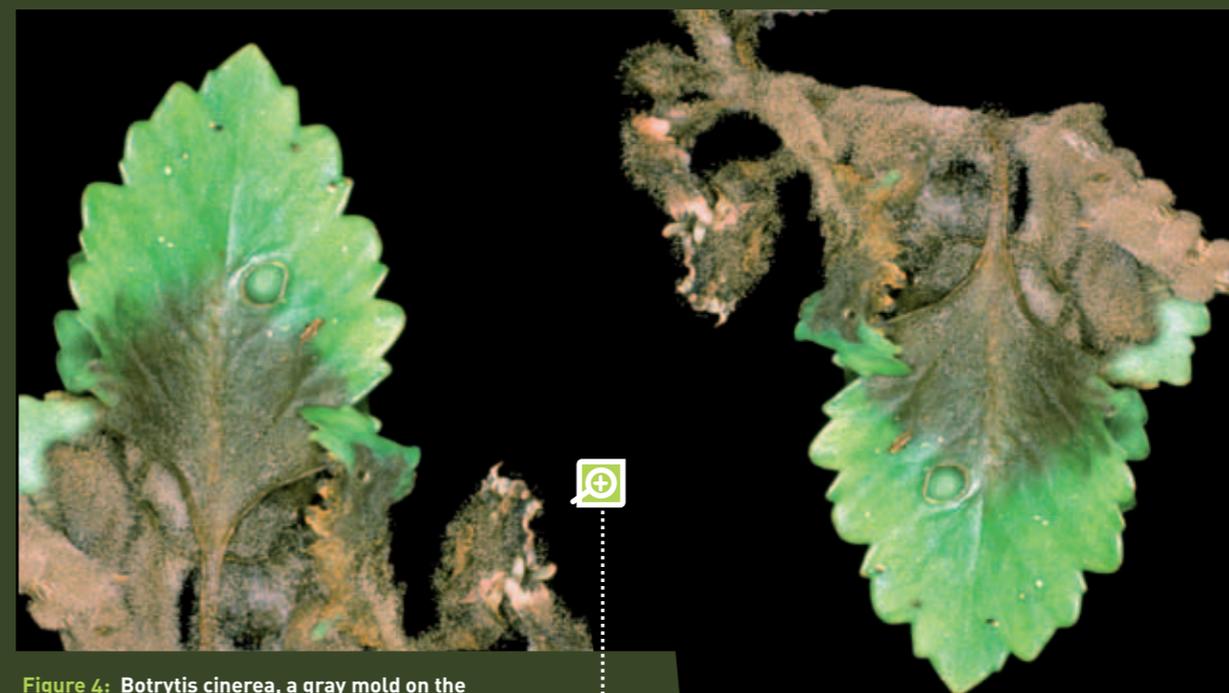


Figure 4: Botrytis cinerea, a gray mold on the leaf of a succulent *Kalanchoe blossfeldiana*.

Clonostachys rosea (= *Gliocladium roseum*) is a fungus that is used to combat and prevent Botrytis attacks because of its ability to suppress the production of spores. *C. rosea* is not the only organism that fights B. cinerea. Some nematode species have also been used to control gray mold effectively. Some strains of *Trichoderma harzianum* have been shown to have an antagonistic effect of the development of B. cinerea in some crops. And some bacteria of the genus *Bacillus* have been identified which are capable of producing substances that inhibit the growth of B. cinerea, which are useful when applied to infected flowers and fruits and the soil to prevent damping off. However, the effectiveness of these organisms depends on various factors such as environmental conditions and the developmental stage of the crop. For crops like strawberries and blueberries, bees have also been used successfully to improve the dispersion and efficacy of these antagonistic bacteria. If a certain amount of beneficial micro-organisms are placed in the beehive, they will be distributed around the crop by the bees.

Fungicides based on natural extracts

Many plant extract preparations are marketed primarily to prevent the attack and development of B. cinerea. Good results have been achieved with extracts of thyme, citrus seed, oregano, mint, garlic and pepper, to name but a few. The components of these extracts are diverse, but many act by inhibiting the germination of conidia or preventing the development of the mycelium.

Biotechnological improvements

Scientists have succeeded in developing transgenic plants in the lab which are not affected by B. cinerea by introducing a resistance gene. This resistance gene encodes a type of protein called polygalacturonase inhibitory proteins. As mentioned above, Botrytis produces enzymes that allow the fungus to infect host cells and some of these enzymes are endopolygalacturonases. Inhibiting this protein means that plants are more resistant to fungal attack.

Noble rot

Botrytis Cinerea is a very common mold, which spreads very easily, both in the vegetable drawer of your fridge and in live crops in the field. Although it is possible to combat this type of mold, it is difficult to get it under control. That's why it has been such a difficult problem worldwide!

However, Botrytis is not always harmful. For example, when ripe grapes are infected in viticulture (grape-growing), the skin becomes more porous and more water can evaporate from the fruit. That benefits the sugar content and produces wine with a better bouquet. This is also known as 'noble rot'. To produce some of the best 'Botrytis wines', the grapes are literally handpicked one by one, so that only those grapes that have been infected by the parasitic mold are selected. In some cases, then, Botrytis can be a blessing for horticulturists. And in nature, molds are certainly a blessing. We have Botrytis to thank for the fact that all the leaves which fall from the trees in the autumn get tidied up so efficiently. And that means that the circle of life can begin anew. •

Questions & Answers

How and when do you recommend using PK-1314 and
 Yes. BIOCANNA nutrients can be used with COCO, but the

you expected to empty the
 reservoir and start
 reservoir and start with a fre

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

Question

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

Answer

CANNAZYM will not affect anything other than cellulose, inside or outside, containers or beds. These enzymes are the same as those found in natural conditions. The one thing we have noted is that better levels of enzymes are found in less cultivated soils. Levels found are always higher under stable, older stands of forest and much less to almost nothing in farm lands that are cultivated continuously. What does this mean? Cultivation causes changes in the amount of fresh material that is present for decomposition in the soil and therefore there is less food available for life forms. The physical structure is also inferior and the pressures from different life forms are also affected. So, if I were turning my bed between crops or even yearly, I would continue to use CANNAZYM. If the beds were left as they were, then I would not worry so much about using it. CANNAZYM is made more for the sterile conditions of modern agriculture, whether in containers or beds. It is made for cellulose only, something not attacked directly except by some specific organisms. Mycorrhizal fungi do not do it, few things do, and most of those are specific so they only take certain steps in the whole process that it takes to break down cellulose. Hope all this helps you decide on what to do.

Question

This year I decided to grow chillies in CANNA COCO. My peppers have already set up a production bloom and fruit. I have a question, can I continue watering them while adding CANNA Coco A&B nutrient or should I only give clean water? Regards.

Answer

As long as the chillies are producing more leaves, flowers and fruits, they continue to need nutrients. But when you see that leaf production is falling back, or you see that some leaf borders are curling or burning, you should reduce the feeding, so the EC. In the autumn, no new leaves will be produced. There are fewer hours of daylight. That's the time to reduce the EC dramatically and bring it back to zero. The taste of the fruits will improve and the plant will draw its last energy from the plant itself. The leaves will turn to autumn colors.

	Weeks	Light per day (hrs)	Temp High (°C)	Temp Range (°C)	Humidity (g/m³)	CO2 (ppm)	PK 13/14 (ml/l)	CANNA Boost (ml/l)	EC
Growing Phase Start root formation	1	18	20	0	40	0	0	0	0.9
Vegetative stage Peak growth	1-3	18/12	40	0	30	25	0	0	1.5
Blooming phase Blooming phase Develops stigmas First sign of first generation Fluorescence	1-3	12	0	50	5	25	0	20-40	1.7
Generative stage Small fruit develop	1	12	0	50	5	25	15	20-40	1.9
Generative fruit Increase in size	2-3	12	0	50	5	25	0	20-40	1.7
Final 2-4 days Fruit increases in size and ripen	1-2	12	0	0	0	25	0	20-40	0.4

Question

I just ordered the CANNA Coco A&B along with the recommended additives. Can't wait to get started with them. After placing my order, I noticed CANNA appears to recommend a run-to-waste application with the coco nutrient. With weekly nutrient changes and tank cleanings, will a recirculating drip system pose any problems with COCO. With all my systems being the above mentioned, I hope I'm in good shape.

Answer

Thanks for giving our CANNA COCO a go. Did you get a copy of the COCO Info paper that is available at our authorized retailers or our website? If not, you should get yourself a copy, or download one. It will explain why it is not the best idea to recirculate with COCO. It will also give you much more information on growing with COCO. Any organic medium is never good with recirculation. They do not work that way. Sure you can mature a crop, but it will never be the best it could be. Organic components all degrade, releasing the substances that the organic component was made of. In the case of COCO, lots and lots of potassium and sodium is released (especially potassium). These two elements will bind up calcium, phosphate and others. When the container drains, the excess is washed out. If it goes into the feed tank, then the levels of these two elements increase and then the problems start. Some growers claim to finish well this way although they are often using intermediate ebb-and-flood systems. We are skeptical of the overall results because we have tried it and know pretty much what to expect. So your answer is: not really a good idea, but some people do it anyway. Another thing to bear in mind is to water COCO when it is dry and not according to a schedule. This can mean 3 days between waterings on newer plants. Never use plain water. Even when you think you need to leach the container, do so at 600 ppm nutrients or at 0.8 EC.



Question

I'm using CANNA Aqua Flores A&B and CANNABOOST. I am in the second week of flowering and my pH is 5.6 and has been for weeks. My EC is 2.1. Is this too high? I also use CANNAZYM every 2 days, and a small dose of CANNA RHIZOTONIC each week. Should I weaken the solution to bring the EC down?

Answer

Thanks for your question! As long the leaves are not curling or burning at the tips or edges, the EC is fine. The EC you mention is high for week 2, but still acceptable. Actually, it means that more water is evaporating from the plants as they take up nutrients. But if the plants look well, don't change anything yet. Please do not hesitate to contact us again for any questions!

Question

I use CANNA A&B in a 70 gallon tank that is refilled about every 4 days. I have an aerator in the tank to keep the water moving. My question is about the aerator. Should I have it on all the time? Is there a danger of anything growing in the mixture? The location is dark and cool. If I could operate the aerator occasionally (such as one hour in every several hours), that would be preferable.

Answer

The short answer is it's probably not necessary. If you are in deep water culture, then yes. If not, then you can get by without the aerator, especially under the conditions you mention. If problems arise, you can always put a small diverter on the pump in the tank to allow some of what is being pumped to shoot back into the tank when it is on. This will agitate the water, adding more air into the system. Injecting air with an aerator causes the availability of nutrients to fluctuate and causes pH drifting, which is not a good idea. I certainly would not have the aerator on all the time, but about twice a day for about 15 minutes.

Question

Hello, can the BIOCANNA nutrients be used with CANNA COCO, or are they meant for soil only? Do you have an organic nutrient that is especially for coco?

Answer

BIOCANNA nutrients can be used with COCO, but there will be some issues. Organic needs the medium to be able both to provide certain nutrients and to serve as a docking station for the mineralization of key nutrients such as nitrogen. This is available only in mineral calcinated soils and peat-based soil less mixes. Therefore, there will always be something missing when you combine any organic feed program with COCO. Coco nutrients are designed to work with Coco medium and is therefore the best combination.



GROW IT YOURSELF



GINGER

the miracle spice

Both our everyday name 'ginger' and the botanical name *Zingiber Officinale* are derived from the Sanskrit word 'sinabera', which translates as 'horn-shaped'. The first growers of ginger thought that the rhizome of the plant – the lumpy tuber to which the rest of the root system is attached – resembled antlers. It's the rhizome of the plant that you see sold as 'root ginger' in supermarkets, and with a bit of imagination you can see the resemblance to an antler.

The spice to cure all ills

Little is known about how ginger first came to be cultivated. Historians think that the plant did not exist naturally in its current form, but was bred by humans. The ginger plant has been known in Chinese culture for over 3000 years. Dried ginger roots found their way from China and India to the Middle East, and eventually to Europe. It was transported via the trade caravans of the 'Silk Route', along with other luxurious spices, gold and precious stone. These days, most ginger still comes from Asia. India produces the largest quantity, followed by China and Indonesia. Other ginger-producing countries include Nepal, Australia, Nigeria and Fiji.

Around 2000 years ago, ginger roots were rarer than diamonds in the Roman Empire and few could afford to buy even a single stem. Ginger was especially prized for its healing properties, which made it a valuable commodity. It was reputed to be a miracle cure for all sorts of ills and ailments. It was a painkiller, a relaxant, a breath-freshener, a decongestant and an anti-septic. And as if that wasn't enough, it was also a remedy for 'flu, colds, catarrh, fatigue, headaches, migraine, nausea, fever, bowel problems, diarrhea, menstrual pain and even impotence.

Sex life

Sometimes, the stories of ginger's miraculous properties took on mythical proportions. One anecdote told of an Arab prince who, although he had a harem full of beautiful women, was unable to produce an heir. He had tried all the remedies that the doctors could offer him, but all in vain. One day, a traveling merchant paid a visit to his palace, and he presented the prince with a mysterious ginger drink. Whether it was down to the

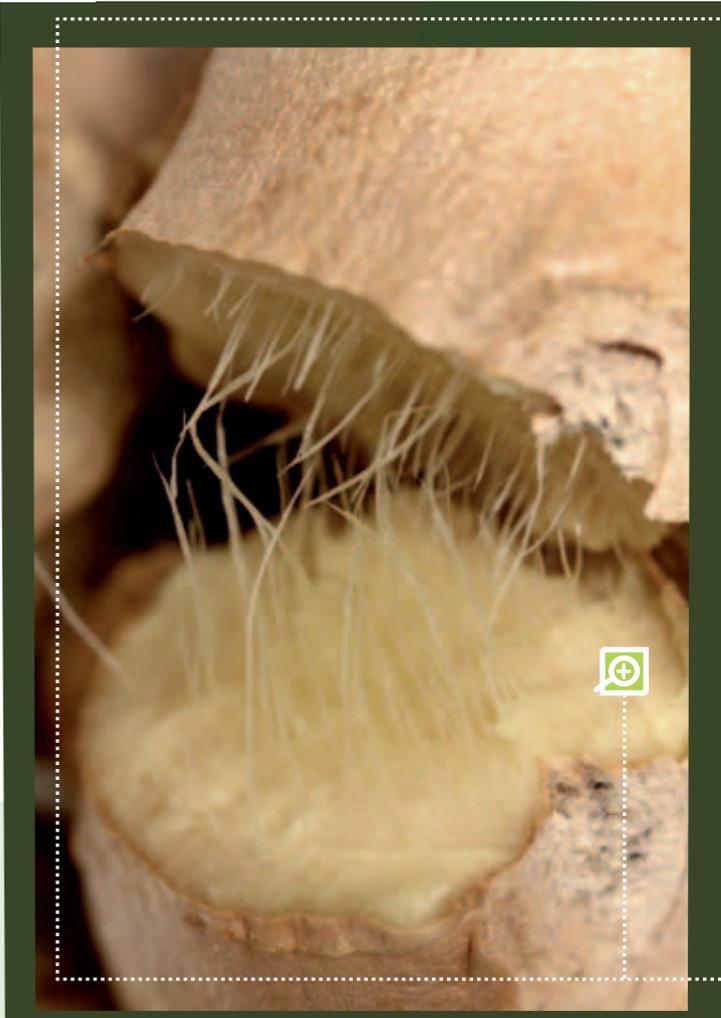


Figure 5: If you want to use ginger in your meal, it's always difficult to grate the fresh ginger to pulp because of the fibers. There are porcelain or ceramic graters available that are designed especially for ginger. These leave you with very fine fiber less pulp. Before you start grating, make sure you peel it as thinly as possible with a spoon so you don't remove the flavor of the ginger root. Most of the flavor is located between the outer skin and the thin fibers, as shown here.

FOR CENTURIES, GINGER HAS BEEN A POPULAR SPICE IN BOTH ORIENTAL AND OCCIDENTAL CUISINE. IN ITS DRIED FORM, IT CAN ALSO BE USED AS A REMEDY FOR STOMACH AND BOWEL PROBLEMS. THE GINGER PLANT IS NATIVE TO TROPICAL CLIMATES. IT HAS ELONGATED, AROMATIC LEAVES, BUT IT IS THE TUBERS, WITH THEIR LUMPS AND FINGERS, WHICH ARE THE EDIBLE PART OF THE PLANT. GINGER IS VERY VERSATILE AND IS USED IN PRODUCTS RANGING FROM SPICY CAKES, BREADS, TO DRINKS (GINGER ALE) AND SWEETS. GINGER IS ALSO WIDELY USED IN ASIAN DISHES. THAT'S NO COINCIDENCE, BECAUSE THE TROPICAL PLANT ORIGINATED IN SOUTH-EAST ASIA. IT HAS PRETTY YELLOW-RED FLOWERS, AND GINGER PLANTS ARE NOW GROWN ORNAMENTALLY TOO. SO LET'S TAKE A CLOSER LOOK AT THIS VERSATILE EXOTIC PLANT WITH A FASCINATING HISTORY.



GINGER

the miracle spice

ginger or one of the other mysterious ingredients is not clear, but whatever it was, the prince was suddenly cured of all his inhibitions in the bedroom. He spent seven days and seven nights uninterrupted in his harem, so the story goes. The prince was so grateful to the merchant that he thanked him with his own weight in gold!

Cooking with ginger

There is a grain of truth in all these ancient legends. Ginger does indeed contain active substances that can have a beneficial effect on the human body. One of these is gingerol, which is converted to shogaol as the root dries out, and counteracts nausea and other stomach complaints.

Of course, ginger is also the perfect way to spice up your cooking. The intensity of the flavor varies according to when the ginger is harvested. The older the plant, the hotter the root will taste. Young ginger roots are softer and more succulent, and have a milder flavor. These young tubers can be eaten fresh or preserved in vinegar, sugary water or sherry, for

example. Young ginger is also perfectly suited for making ginger tea. Just add sugar and lemon to taste! The juice of older tubers, by contrast, has a very strong flavor and is often used to flavor oriental recipes. The hotter varieties of the ginger root are an indispensable kitchen ingredient in China, Japan and many other South Asian countries. For example, fresh ginger is one of the most important ingredients in Indian curries and it is widely used in Burmese dishes, too. The ginger drink wedang jahe, which is made from ginger and palm sugar, comes from Indonesia. In Bangladesh, ginger is finely chopped or ground into a paste with garlic and shallots. The paste is then used as a basis for chicken and meat dishes.

Grow it yourself!

Ginger is a tropical plant which you can easily grow yourself and which does not require much expert knowledge. You start with a piece of fresh root ginger (actually the rhizome of the plant), which you can buy at any supermarket. Choose a piece

which has some well-developed 'growth buds'. The shoots will develop from these buds.

The next step is to break the root into pieces with a growth bud on each piece, and to plant these pieces in a seed tray in moist potting compost, with enough nutrients and good drainage. The usual time of year to do this is around the end of winter or the beginning of spring.

Keep the seed tray indoors, because most ginger is not winter hardy. Central heating can make the air a little too dry, so it's a good idea to spray the plants with a mister once in a while. Ginger plants love light and warmth, but they can do just as well in strong sunlight. Avoid cold, wind or drafts at all costs.

The growing tips at the end of each 'finger' of the rhizome will sprout quickly. Long, slim leaves will grow from the end, which look much like sprouting grass. Within eight to ten months, the ginger plant will be fully grown. The plant can grow up to a meter and a half tall so you should allow some space to accommodate it. •



RECIPE

After all that talk about ginger, we couldn't finish without giving you a recipe for a sumptuous Thai stir-fry with ginger! No need to worry it won't take you long to prepare this. It's really quite simple and excluding the time needed for the marinade, it only takes about ten minutes!

You will need:

- 3 spring onions cut into rings
- 1 Spanish pepper cut into rings
- 2 cloves of garlic, finely sliced
- Grated ginger
- A few drops of fish sauce
- Sesame oil
- 1 dessert spoon of olive oil
- Half a cucumber, with the seeds and peel removed
- 10 tiger prawns, raw and peeled.

Preparation:

Throw all the ingredients together in a wok and let them marinade for an hour. Then turn on the heat and stir-fry the whole lot for about four minutes until the prawns are cooked. Serve with rice or noodles. Enjoy!

Figure 6: It's easy to grow a ginger plant from pieces of ginger root. The green nodes seen in the picture, which look like the 'eyes' of a potato plant, are called 'meristem'. When a ginger root is placed in the ground the meristem will develop into a root or offshoot depending on the conditions. What the meristem will grow into is determined by gravity, temperature and moisture levels.





Mushrooms DID YOU KNOW....?

- The mushrooms pictured here are called *Scutellinia scutellata*, also known as the eyelash pixie cup.
- Some species of mushrooms are edible. But mushrooms can also be toxic, mind-altering, or have antibiotic and antiviral qualities.
- The death cap (*Amanita phalloides*) is one of the most poisonous mushrooms in the world. It is responsible for the majority of fatal mushroom poisonings worldwide.
- The white truffle is the most expensive edible fungus in the world. In 2010 a Chinese casino owner named Stanley Ho paid the record price of \$330,000 for just under one kilogram of these rare but delicious truffles.
- For growers, the presence of fungi or mushrooms around plants is not always a bad sign. If mushrooms grow in potting soil, it means the soil is fertile and full of beneficial life forms.
- In agriculture, some fungi are used for pest control. They can suppress the development of pests like insects, mites and even other fungi.



A word from
A GROWER

Growers TALK

Hi, I am Steven, from Bakersfield, CA. I love plants and cooking with vegetables. So after I lost my job in the recession, I thought why not grow some veggies myself? It's not that I had better things to do with my time, besides visiting my work coach at the local unemployment office... I thought, maybe this could become my new profession, growing vegetables and selling them to restaurants. Who knows where this thing might go?

Well, as it turned out, it all went to crap...

I decided – advised by a friend – to grow eggplants on COGr. I chose eggplants, because most aubergines you find in supermarkets taste like a rubbery old shoe sole. I purchased some seedlings at a garden center, and planted them in rock wool cubes. I soaked the COGr board in water, and put the rock wool cubes into the swollen cocos.

Now for the right nutrients. This friend of mine – who is also a grower – told me that a set of CANNA COGr Flores (A&B) would suffice. According to him, COGr Vega wasn't really necessary, and since I didn't have much money, I took his advice.

I started using CANNA COGr Flores with each watering, just as my friend advised. One week later, the first roots appeared. So far, so good.

In the weeks after that, I noticed that my plants grew, but not as much as they should. I also noticed that there were rusty brown spots and faint yellow spots between the veins of the

leaves. But still, the plants were flowering, so I reckoned that everything should still be all right.

About ten weeks after I had planted my seedlings, I had my first crop of eggplants. There were not as many as I hoped for, and they really looked awful. There were black spots on the fruits where the flowers used to be and they tasted like crap. I also noticed that the yellow spots on the leaves were getting bigger, and they were beginning to appear at the edge of the leaves as well. Some leaves looked like they were totally burned! Shortly after that, my plants started to die, one leaf at a time. The rusty brown spots were spreading all over the plants, which looked really sick.

I started to panic. What could I have done wrong? I asked my friend, and he said he didn't know. He never had this problem, he said. Maybe I over-watered them? I decreased my watering frequency. That didn't help at all. So my friend advised me to go to the hydroponics store.

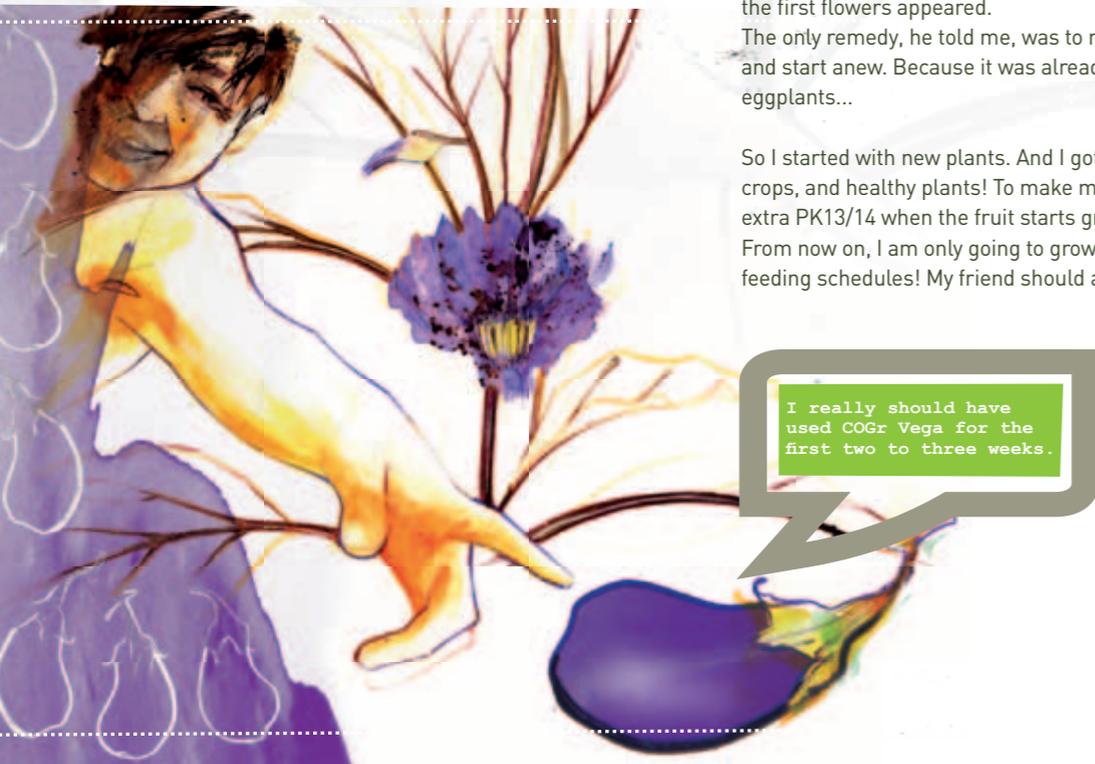
Which I did. I explained my problem to the guy at my local hydroponics shop. He told me my plants were probably dying from a calcium and magnesium deficiency. First of all, I should have added Buffer Agent to the water when I made my COGr board ready for use, because it's rich in calcium and magnesium. He also said that my friend had been wrong about the nutrients. I really should have used CANNA COGr Vega for the first two to three weeks, and switched to Flores only after the first flowers appeared.

The only remedy, he told me, was to remove my plants, and start anew. Because it was already too late for my poor eggplants...

So I started with new plants. And I got astonishing results! Rich crops, and healthy plants! To make my yields even bigger, I add extra PK13/14 when the fruit starts growing.

From now on, I am only going to grow according to the CANNA feeding schedules! My friend should as well! •

I really should have used COGr Vega for the first two to three weeks.



Product

FLASH

Now Available!



CANNA Start

CANNA is proud to announce the availability of "CANNA Start", a unique nutrient specially designed to meet the needs of seedlings and cuttings. CANNA Start is developed by CANNA Research after thorough testing and development. It further extends our range of products to cater growers even better.

What?

CANNA Start can be used on various propagation substrates like rock wool plugs, coco pellets, jiffy plugs, seed mixes and most other propagation mediums (with the exception of re-circulating systems and clone machines).

It provides all the primary, secondary and micro nutrients for a cutting or seedling to develop into a strong healthy plant. CANNA start is a nutrient (not an additive for root development) and can be combined perfectly with a root stimulator like CANNA RHIZOTONIC.

CANNA Start is a complete one-part nutrient meaning it contains all the needed elements in one bottle (no A and B versions needed).

Why?

Cuttings and seedlings have different needs than established plants. Therefore a normal nutrient for the vegetative stage is not suitable for cuttings and seedlings because you run the risk of overfeeding. Diluting a vegetative nutrient to make it more suitable for cuttings and seedlings isn't the answer either. When you dilute, you'll dilute all the elements, also the micro and macro elements. In that case there won't be enough of these elements available to suit the cutting or seedling's needs. This causes yellowing of the plant material; not a good start for your crop. To ultimately achieve strong, healthy plants at the end you have to start off right at the very beginning. That's why CANNA developed CANNA Start; to get the exact ratio of all nutritional elements for cuttings and seedlings right. After all, well begun is half done!

Who?

- CANNA Start is perfect for growers that:
- Grow from seeds
- Take their own cuttings
- Put their cuttings in small pots first, before transplanting them into the final medium

Where?

CANNA Start is available through one of our CANNA Dealers in the USA. To find the closest near you, please go to our website www.canna-hydroponics.com CANNA Start is available in 0.5, 1 and 5 liter bottles.

For more information about CANNA Start please go to our website or write to info@canna-hydroponics.com





What's HAPPENING

ART SHOULD BE A CRIME

What is the point of art, if it does not upset anyone? If it doesn't get people talking? One of the few genuinely rebellious art forms these days is graffiti. This kind of street art has actually always been around, but it keeps regenerating itself, as new generations of artists come up with their own interpretations. Each in their own way, they try to make public areas more interesting – or vandalize other people's property – it all depends on how you see it. And spray paint is not the only tool that today's graffiti artists use. They also make use of stickers, stencils, posters and even mosaics. By Paul van de Geijn

Antique graffiti

Graffiti is just about as old as humanity itself. Take the paintings made with pigment and animal bones on the walls of caves for example. These were the earliest known form of art, but you could also call them ancient graffiti.

In Roman times, too, there was a lot of writing and carving on walls. The best-kept examples of Roman graffiti can be seen in Pompeii, the Roman city that was preserved under volcanic ash and lava, which was later uncovered to reveal a snap-shot of a Roman city. "Restituta, take off your tunic, please," reads one piece of writing on the wall of a bar.

Graffiti as we know it today first got started on the walls of Philadelphia and New York in the 1960s. Young people from all backgrounds started leaving their 'tag' on walls – a kind of signature mark made with paint or a marker pen. After a while, when everyone was at it, some kids wanted to differentiate themselves. They sprayed their tags onto the wall using fat, bubble-gum letters. Over time, these letters have become more and more intricate.

Since the advent of urban music like hip hop, graffiti can be seen everywhere. These days you even see murals on farmer's barns and village pubs. As long as there is a motorway or a railway nearby, because graffiti artists want as many people as possible to see their work.

Banksy

One graffiti artist whose work has probably been seen by more people than any other is the British artist Banksy. This mysterious figure – who according to some is really called Robin Banks and comes from Bristol – uses stencils and elements from the real-world environment. His characteristic style has made him famous all over the world. 'Exit Through the Gift Shop' was nominated for an Oscar at the beginning of this year for 'best documentary', but just missed out on an award.

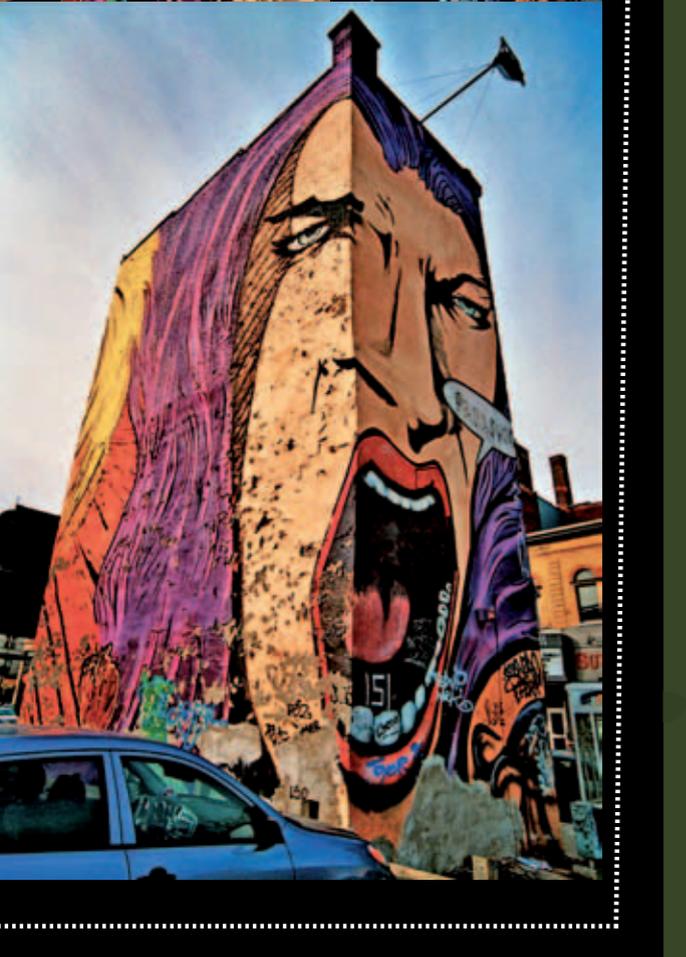
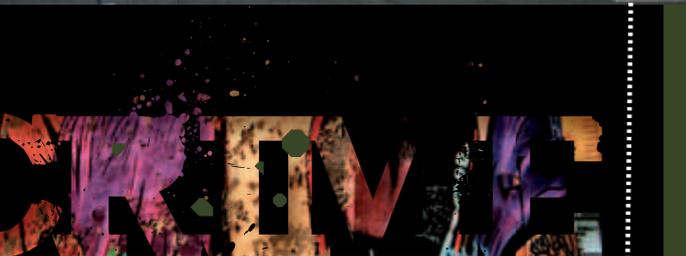
Banksy works using stencils because graffiti can be done much more quickly that way. Before he started working with stencils, the police would often arrive before he had the chance to finish. His work often looks very realistic, almost like old black and white illustrations from children's books. However, this style is not unique for Banksy. It was originally developed by the French graffiti pioneer Blek le Rat.

Cha-ching!

Anonymous or not, the 'anti-capitalist' Banksy has no problem stepping out of the shadows for buyers and he has earned some serious sums of cash. His monkey wearing a sandwich board – which reads 'Laugh now, but one day we'll be in charge' – was sold for \$370,000.

But most graffiti works are never sold at all. The majority of graffiti artists, or 'writers' as they are also known, do it purely for the kick and to satisfy their artistic impulses. And for their reputation on the scene, of course. The highest status is that of 'king' or 'queen'. Painting over work done





by a king or queen is seen as a declaration of war. Banksy is a king, for example, and the French artist Miss Van is a queen, who paints gutsy female cartoon-style figures using acrylic paint. They are often 'provocative and sometimes erotic'. Miss Van, who is from Toulouse in southern France, loves the illegal aspect of graffiti. Because it's against the law, there are no problems with censorship. 'It is also a challenge', she writes on her website. 'Each time I paint on a wall, there is the risk of seeing my work erased.'

Gas mask

Graffiti can sometimes be highly political. The most famous example of politics in graffiti are the murals of Northern Ireland. In this highly religious and divided region, these murals indicate the political and religious views of the surrounding neighborhood. The most famous muralists are the Bogside Artists. Their work is Catholic and pro-Ireland, but it stands head and shoulders above other murals. They use a lot of black and white, probably because it produces such a dramatic effect. One famous image is of a young boy wearing a gas mask and carrying a petrol bomb during the 'Battle of the Bogside' in Derry/Londonderry, 1969.

Minor deities

Work by the Bogside Artists, Banksy, Miss Van and legendary figures from history like Jean-Paul Basquait (who died at the age of 27 from a drug overdose) and Keith Haring (who died from AIDS at 31) are considered art by most people. But the work of lesser-known graffiti artists is still often viewed by many people – including the authorities – as vandalism. And as such, it is still punishable with stiff penalties. That is certainly the case in the USA. In 2008, for example, 19-year-old Ralph Mirabal was sentenced to eight years in jail and a \$5000 dollar fine. Ralph had covered a children's hospital and thirty houses with his tags. 'You spray, you pay,' commented the Texan judge that sentenced him. The members of the church that he had covered thought that the boy – by spending eight years locked up with hardened criminals – would learn his lesson. 'There is a difference between forgiveness and punishment,' said a church spokesperson.

Art is not a crime

Punishing graffiti artists provokes a variety of reactions. 'Art is not a crime,' is one often-heard argument. But even within the graffiti community, there are people who can understand why punishments need to be given out. Reacting to an internet clip showing arrested taggers, 'DlCKxFTTR' remarks wryly that 'graffiti is not a crime' but that covering other people's property with paint is – indisputably – against the law. He then admits that he does it himself, and that actually, the fact that it's illegal is part of the kick that he gets from it. 'Half of us writers steal the paint and use a bolt cutter to get in wherever it is we want to write. I'm happy that it's illegal, because it gives me that feeling of being a rebel with a cause.' In other words, art should be a crime.... And Banksy – no matter how much some people might see him as a commercial sell-out since his enormous success – would surely agree with that. •

Grower's TIP #13

By Geary Coogler, BSc. Hort

Preventing INFECTIONS

When it comes to growing, indoors or outdoors, the old adage "cleanliness is next to Godliness" could not be more appropriate. Simple things, like removing any dead vegetation that falls to the floor, container or table, are critical. Botrytis spores from a decomposing dead leaf are just as active as those from a live leaf. Insects like thrips will descend from the plant in the early afternoon and spend most of their time among the debris below the plants. Old soil or soilless medium left in a reused container can be a great habitat for any number of fungal and viral diseases, as well as certain insects. So remove the debris. Clean your equipment – like pruners and drippers – before reusing it. And then between crops, sterilize your table tops using a 10% bleach solution. All of these simple sanitation measures will reduce the number of problems in your growing area, and make the occasional problem that does arise easier to handle.

INFECTIONS

The grateful gardener



The Grateful Gardener By Georgia



PLANTS AND PLAGUES



PLAGUE. THE WORD CONJURES UP VISIONS OF RATS CRAWLING WITH FLEAS READY TO LEAP ON UNSUSPECTING HUMANS TO INFECT THEM WITH THE DEADLY PLAGUE BACTERIA *YERSINIA PESTIS*. PERHAPS IT BRINGS TO MIND SWARMS OF LOCUSTS, BLOTING OUT THE SUNLIGHT AND INTENT ON DEVOURING EVERYTHING IN THEIR PATH. BUT THOSE ARE NOT THE ONLY KINDS OF PLAGUES, AS ANYONE WHOSE WELL-TENDED GARDEN HAS BEEN DEVASTATED BY THE SUDDEN APPEARANCE OF A MUCH-DREADED PATHOGEN CAN ATTEST.

Plants have many enemies ranging from worms and insects that are visible to the naked eye, to microscopic single-celled organisms and non-cellular pathogens that are only visible under powerful electron microscopes. These agents of horticultural disease may be small, but they can have an enormous effect. They twist plants into tortured shapes, turn them ugly shades of brown and cause billions of dollars of economic damage every year.

Although insects are a major concern to growers, they are biologically quite different from agents of infectious plant diseases. Insects are multicellular animals, exhibiting levels of complexity and behavior far beyond those seen in other less noticeable pests. Thrips, flies, aphids and other insects or mites may be spotted by inspecting plants carefully before they do significant damage. Other threats are more insidious and often remain unnoticed until the damage is well underway. Exactly what threats are these? They are bacteria, fungi, protists and viruses.

Bacteria

Life on Earth can be broadly divided into two major branches – eukaryotes and prokaryotes (see table 1). Bacteria are prokaryotes and they differ from eukaryotes (such as protists, fungi, plants, and animals) in a number

of important ways. Bacterial cells are smaller, have free-floating genetic material (DNA) within their cells, and are much simpler in their internal organization and structure.

Bacteria are found in virtually every imaginable habitat and what they lack in complexity, they make up for in sheer numbers. A single gram of soil can contain more than a billion individual bacteria and thousands of different species. The exact number of bacterial species is unknown, but it is surely in the tens of thousands (at least!).

As far as plants go, most bacteria are completely harmless and some are beneficial. In the case of legumes (members of the pea family), nitrogen-fixing bacteria live in the plants' root nodules where they provide a ready supply of nitrogen that would not otherwise be available from the soil.

Although fungi and viruses are more common agents of plant diseases, bacteria also cause their share of problems. Healthy crops are generally quite resistant to attack from bacteria, but plants suffering from other diseases or that are in a poor state of health are more susceptible. Injured plants can be colonized by bacteria that find their way into plant tissues through wounds. The symptoms of bacterial infection can be mistaken for other infections, especially at an early phase. Typical



Figure 7: Leaf infected with rust fungus. Coloured scanning electron micrograph (SEM) of rust fungus spores (reproductive cells) inside a gall on a soya (*Glycine max*) leaf. A gall is formed when the spores are produced inside the leaf and then rupture through the surface to infect more leaves and plants. This fungus is an important disease in cereal crops and other commercially grown plants because it severely restricts plant growth, reducing the yield.

symptoms include discoloration or spots on plant parts. When things get really bad, the infected tissues become soft and may even melt into a blackened or oozing slimy mess. Blossom end rot is a bacterial disease of some fruit-bearing species in which the fruit develop soft black lesions at the part of the fruit where the flower formed. Not a pretty sight. In theory, plants can be treated with antibiotics to control bacterial diseases, but in practice it is usually best to cut away affected parts, or completely remove infected plants, and hope for the best.

Fungi

Fungi - like plants, protists and animals - are eukaryotes. Compared to bacteria, fungi have a much more complex cellular structure and organization. The fungal kingdom is quite diverse and includes yeasts, molds and mushrooms. Fungi reproduce asexually by generating large masses of spores through cell division (mitosis). Sexual reproduction is also common with two compatible mating types fusing to undergo meiosis and produce reproductive spores possessing a combination of traits derived from each of the parents.





Yeasts grow as single cells or small clumps of connected cells. Molds and mushrooms have cells called hyphae, which are thin and cylindrical and grow from their tips to explore the environment to seek out nutrients. Although individual fungal cells are microscopic, fungal colonies are often visible as a large mass of hyphae called a mycelium. Turning over a rotting log in the woods often reveals white, fuzzy wisps of mycelium.

Most people are familiar with mold fungi. They can be found growing on food or other decomposing material. Molds are remarkable because of the colorful asexual spores that they produce on top of the growing mycelium. Mold spores come in many colors including shades of brown, black, green, blue, yellow, purple and even red. The overwhelming majority of fungi live as saprophytes, which means they obtain their nutrients from dead organic matter. Along with bacteria, fungi perform a critical role in the environment as they break down and recycle organic matter. Some fungi are beneficial to plants. For example, a mycorrhiza is a symbiotic relationship between a fungus and the roots of a plant. The fungus provides mineral nutrients for the plant and the plant provides carbon compounds produced by photosynthesis for the fungus. Most plants on Earth engage in this mutually beneficial relationship.

Unfortunately for both animals and plants, some fungi are parasitic. Fungal infections are particularly troublesome because fungal cells are similar in many ways to those of other eukaryotes (such as plants), which makes it a challenge to find treatments to attack the fungus selectively, without also causing harm to the host. Despite this, much research has been devoted to combating plant fungal diseases and options exist for most commonly encountered fungi. Like bacteria (and viruses too), fungi can find their way into a host plant through wounds. They can also attack plants directly by using special hyphae to penetrate healthy tissues. There are thousands of different plant diseases caused by fungi including rusts, smuts, blights, damping-off disease, and root, stem and fruit rots.

The first line of defense against fungi is the use of disease-resistant cultivars. Selective breeding, and in some cases genetic engineering, has led to resistant strains of many economically important crop species. Even so, resistant strains are not always available and resistance does not imply immunity. Preventive treatment with fungicides is costly and often effective but the environmental soundness of this practice is questionable. Despite growers' best efforts, fungal diseases persist and new or previously unknown strains of fungal pathogens continue to appear. Treatment options for fungal diseases include cutting off diseased parts or removing infected plants. Culled plants can be burned or wrapped in plastic and disposed of as trash. Natural anti-fungal treatments include solutions of copper and/or sulfur or hydrogen peroxide. Many 'home remedies' such as garlic or horseradish are of questionable value (but they might work in certain cases).

If you try cutting back infected parts, removing infected plants completely, or using organic treatment methods, and none of this stems the tide of fungal destruction, commercial fungicides tailored for specific plant-fungus combinations are available. These chemicals should only be used in accordance with the manufacturer's instructions.

Much can be done to discourage the appearance of fungal infections in a crop. Proper air circulation, humidity control, and appropriate irrigation strategies will go a long way toward keeping plants healthy.

Protists

Protists differ from plants and fungi in that they are able to move actively in the environment by crawling or swimming with the use of flagella or cilia (fine hair like structures that act like tiny oars). These organisms include what many people still call 'single-celled animals' and include genera such as Paramecium, Euglena and various kinds of amoebas. Protists are truly weird creatures with some species exhibiting characteristics of plants, animals or fungi at different times during their life cycles.

As far as plant diseases go, it is the 'fungus-like protists' that are of greatest concern. This includes species that were once classified with the fungi because

they grow and look like fungi. The infamous Irish Potato Famine (1845-49) resulted from a widespread and devastating potato blight caused by the protist *Phytophthora infestans*. Other phytopathogenic protists include members of the genus *Pythium*, which cause root rot, and organisms such as *Plasmopora* that cause downy mildews.

Controlling the temperature and humidity around plants helps to keep protists at bay, but this is not possible with outdoor crops. Blights caused by *Phytophthora* are a problem for potatoes, tomatoes, and related species, but several cultivars of these plants show excellent blight resistance. The onset of disease is marked by the appearance of brown spots on leaves and the infection can quickly result in severely deformed, wilted or rotting plants. The best treatment is the immediate removal of the infected individuals. Spraying susceptible crops with Bordeaux mixture (a solution of copper sulphate and lime) helps to prevent infection.

Downy mildews and blights caused by fungus-like protists can also be treated with neem oil, peroxides, and bicarbonate (baking soda) based solutions. Biocontrol organisms such as the bacteria *Bacillus subtilis* may be effective in treating diseases caused by both fungi and fungus-like protists.

Viruses

In many ways, viruses are the odd organisms. In fact, there are those who do not consider viruses to be living organisms at all. However, the more we learn about the molecular biology of viruses, the more it seems that they should be considered "alive" in the most fundamental sense. Unlike the disease agents discussed so far, viruses do not have cells. They do not move, have no metabolism, and do not require a source of "food" to survive. Outside of a host, some viruses can be crystallized and stored in a jar on a shelf as if they were just some purified chemical awaiting use in a lab experiment. Under certain specific conditions, however, they are quite efficient at one particularly important aspect of life - reproduction.

A typical virus consists of a protein coat or outer shell that encloses and protects a small amount of genetic material. Viruses possess just enough genetic material to perform a few basic functions. Viruses are parasites that require a host cell to reproduce. They rely on their ability to hijack and reprogram the molecular machinery of their cellular victims to do most of the work for them.

Viruses are seldom a major problem in naturally occurring plant populations where there is a diverse range of species. In crop systems, they are presented with a large number of individuals of the Essentially asexual only-same species, often in dense populations. This is an ideal situation for a virus that finds itself in the right place. Viruses are seldom lethal to plants, but they reduce productivity and cause appearance problems that seriously damage the economic value of a crop. Virus diseases in lettuce, tomato, cucumber and many other plants are a concern and generally manifest themselves as a yellowing or spotting of leaves and stems, curling of leaves, or abnormal fruit development.

Viruses may enter plants through wounds or they can be transmitted by insects, nematodes or mites. Controlling these vector organisms is an important preventive measure. Since viruses are not based on any form of cellular organization like that of other plant pathogens, few treatment options exist. Chemicals simply do not work. As usual, infected plants should be removed. Since chemical treatments are not a viable option, much work has been done to produce virus resistant cultivars and these should always be chosen if available. It's a tough world out there for plants, and humans have made it even tougher by growing plants in mono-culture, packed together in as little space as possible, and in the same location year after year. This presents an ideal situation for persistent plant pathogens to gain a foothold and keep coming back. By rotating crops, ensuring the best possible environmental conditions, using disease resistant cultivars, and occasionally and judiciously applying chemical treatments when necessary, growing success can be achieved. •

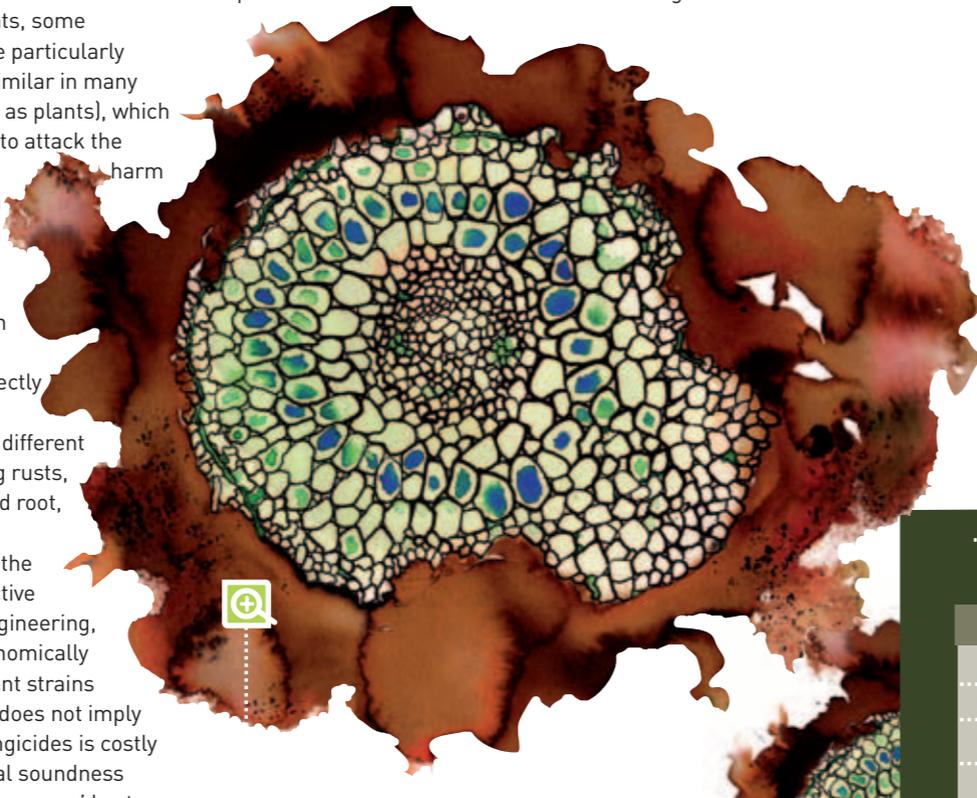


Figure 8: Root fungus. A cross-section through a root containing fungal hyphae called endotrophic mycorrhiza. The hyphae (green and blue) are in the inter-cellular spaces and inside some cells. The hyphae extend into the soil and pass mineral salts and water up to the root, so it no longer needs the hairs that normally serve this function. The plant supplies the fungus with sugars and other organic substances, enabling a mutually beneficial (symbiotic) relationship.

Table 1. Comparison of eukaryotes, prokaryotes and viruses

	EUKARYOTES	PROKARYOTES	VIRUSES
Types of organisms	Plants, animals, fungi, protists	bacteria, archaea	Non-cellular
Cells	large	small	no
Genetic Material	Linear DNA molecules in nucleus	Circular DNA free floating in cell	Small amount of DNA or RNA
Cell Wall	Present in plants, fungi, and fungal-like protists	present	no
Motility (ability to move)	Protists and animals only	some	no
Photosynthesis	plants and some protists only	some	no
Diverse Organelles in Cells	yes	Less so	no
Reproduction	Asexual and sexual	Essentially asexual only	Requires host cell



Puzzle

& WIN

great prizes

Summer is here... There's nothing like enjoying the good weather with a nice cool drink and your latest copy of CANNAtalk! But after all that relaxing you might be in the mood for a challenge. But nothing too strenuous, of course, it's the middle of summer... So why don't you take a look at these pictures? Can you spot the five differences? If you can, send us your answers by email at editor@cannatalk.ca. Who knows, you might be the lucky winner of a bottle of CANNA Start, a balanced one-part nutrient for seedlings and (rooted) cuttings. (More info about CANNA Start can be found on page 19 or on www.canna-hydroponics.com) Have fun!!!



Win a bottle of CANNA Start!

Winner
puzzle #11

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

Mr Parks.

Congratulations on your CANNA COCO nutrients!

We will contact you as soon as possible to organize the dispatch of your prize.

CARAWAY and PEPPERMINT

slow down root rot in Pea plants

The effects of Caraway powder (*Carum carvi*) and peppermint extract on the growth of *Sclerotium Rolfsii* (a nasty soil fungus that is active in a number of food crops) is being tested in a research study. When both extracts are combined at a concentration of 6% or higher, the growth of the fungus can be stopped completely. More research and testing is needed as to why this combination of Caraway and Peppermint is so effective against this fungus.

Source: Journal of Plant Protection

silicon

more important for plants than first thought

Silicon is not considered one of the essential elements for plants. However, it does have an important function for plants. Plants grown in a test environment can grow well without this trace element, but plants grown outside will topple over without silicon. This is because plants need silicon to give them sturdiness. This sturdiness is needed for plants to stay upright when it is windy. Now, tests have shown that plants are also better protected against diseases and pests when silicon is present in the soil. One explanation for this phenomenon is that silicon may form a mechanical barrier.

Source: Annals of Applied Biology

Facts



RED lettuce healthier than GREEN lettuce during nice weather

A research study has shown that lettuce varieties Lollo Rosso and Lollo Biondo react differently to UV light. During a test, lettuce was grown under poly plastic in three different ways. One allowed a high amount of UV light through, the second allowed a low amount through and the third blocked out all the UV. The results? Green-colored lettuce show no reaction to the different amounts of UV radiation. The red lettuce showed a phytochemical reaction. With higher amounts of UV light, more anthocyanine, luteolin and quercetin were produced. The total amount of phenols also increased in the Lollo Rosso as the plant received more UV light. This is interesting information for horticulturists, because lettuce is grown in poly tunnels more and more and the amount of phenols is used to define the nutritional value of vegetables and fruit. Whether UV light also influences other varieties is worth examining. So far, no difference has been found in the way that strawberries, raspberries and blueberries react to the different intensities of UV light.

Source: Food Chemistry

Facts

WHAT'S NEXT

Light. This amazing natural phenomenon gives us the colors we can see around us, and even some that we can't, like ultraviolet and infrared. Light is so important that without it, not only would your plants die, but all life on this planet would perish. So in the next edition of CANNAtalk, we'll be illuminating this essential subject.

Of course, there'll be other features too. Expect the usual blend of useful information and tips in our brand new 'Pests and Diseases' section. And if you want to read about something that has little to do with plants – except maybe jumping over them – check out our 'What's Happening?' feature. Getting from A to B in a straight line, no matter what object or building is in the way... That is the basic principle of free-running and parkour. Read all about these spectacular urban sports in the next edition of CANNAtalk!



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CANNAtalk

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

BENEFITS

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