

CANNAtalk

MAGAZINE FOR SERIOUS GROWERS

ISSUE 9 2010

MILDEW

The continuing
story



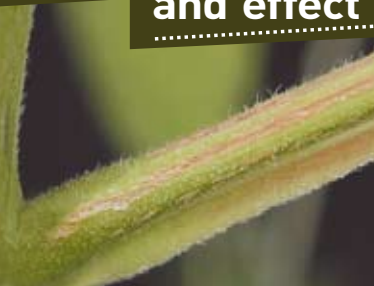
Burning MAN

Festival



Plant HORMONES

Function
and effect



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HOTalk:

As our company's philosophy is "Quality proves itself", we've always figured Beauty is only skin deep, All cats are grey in the dark, Handsome is as handsome does, Beauty is in the eye of the beholder and you certainly Can't judge a book by its cover. Besides, still waters run deep, don't they?

Man, were we naive?! The number of sayings and proverbs there are about looks should have been our sign on the wall. And despite all the wise conclusions indicating looks are not that important, practice and psychology show the exact opposite.

So we thought it was time to start paying a little more attention to our magazine's look and get it more in line with its inner beauty. Of course our first aim will always be to inform and help out growers the best way we can. We just hope the brand new look will appeal to you. And maybe it is naive but we can't help but to believe that it is probably looks that might get your attention but it's personality that captures your heart ;-). Anyways, don't hesitate to let us know what you think. Any reaction is welcome. We can't do it without your feedback so please write us at editor@cannatalk.com

In the previous edition of CANNATALK we highlighted the plant hormone 'Florigen.' This edition elaborates on that with the functions and effects of different plant hormones. We'll also continue Inaki Garcia's story on Oidium and Mildew which started in issue 8 and continues here with a third fungus that differs from the previous discussed two. Next to some familiar regular items we're introducing a new one called What's happening? This feature will pay attention to anything cool going on in the world. It might be a new trend, an awesome experience or upcoming event. As long as it is fun and interesting. This time: Burning Man Festival. Check it out!

Enjoy reading!

Jeroen

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PLANT HORMONES

FUNCTION AND EFFECT

HORMONES ARE ORGANIC MOLECULES THAT CAN INFLUENCE THE PHYSIOLOGY

AND DEVELOPMENT OF PLANTS AND ANIMALS EVEN AT LOW CONCENTRATIONS.

HORMONES PLAY AN IMPORTANT ROLE IN THE GROWTH AND FLOWERING OF THE

PLANT AND MANY OTHER THINGS. THIS ARTICLE BRIEFLY EXPLAINS HOW PLANT

HORMONES WORK IN PLANTS AND HOW HORMONES ENSURE THAT PLANTS FLOWER.

Hormones are produced by and transported throughout the entire plant. Simply put, they are signals, chemical signals, that can be sent and received throughout the entire plant. A leaf can and will transmit a signal to the end of the stem telling it to form flowers for example.

The most well-known plant hormones are auxin, gibberellin, cytokinin, ethylene and abscisic acid (abscisic acid) (see figure 1). In addition, it has been demonstrated that brassino-steroids, salicylates and jasmonates also function in a similar way to hormones.

Hormones can also occur bonded to sugars or amino acids. In this form they are inactive and provide storage. The hormones can be released again and become active under various conditions such as the influence of gravity or light for example.

Auxin

In the 1880's Charles Darwin and his son Francis started experiments that finally confirmed the existence of plant hormones. They experimented with oats and the influence of light on the direction of growth. Auxin was the plant hormone whose processes were demonstrated during these experiments. Auxin is produced in the plant's growing points both above the ground and in the roots. Auxin influences water absorption, cell division and cell stretching (it softens cell walls) among other things. Because auxin promotes the formation of roots on stems it is used in a variety of forms in rooting hormones. Experiments carried out by CANNA have shown that the effect of administering auxin depends very much on the concentration and method of application used for each plant type. With weak concentrations flower formation is stimulated slightly and ripening takes longer. With high concentrations there is an inhibiting effect on growth accompanied by deformities and tumour-like symptoms. Auxin that is produced in the tops of plants is capable of

inhibiting the development of side shoots. This symptom is known as apical dominance. Removing the main tip stops the inhibiting effect and side shoots then develop which will eventually result in a broader plant. Where crop spacing allows only a few plants per square meter it is worthwhile removing the main tip as this makes it possible to use the light more efficiently. It's also necessary to remove the tips regularly to achieve a good stock plant for propagation so that it will grow many more side shoots.

Gibberellin

Gibberellin was first isolated in 1935 in Japan by Yabuta. The gibberellin was acquired from a fungus that had been the cause of reduced productivity for Japanese rice farmers for centuries. The gibberellin initially gave better growth but later in the season it caused sterile fruits. Generally speaking, gibberellins work as growth accelerators because of cell stretching and cell division.

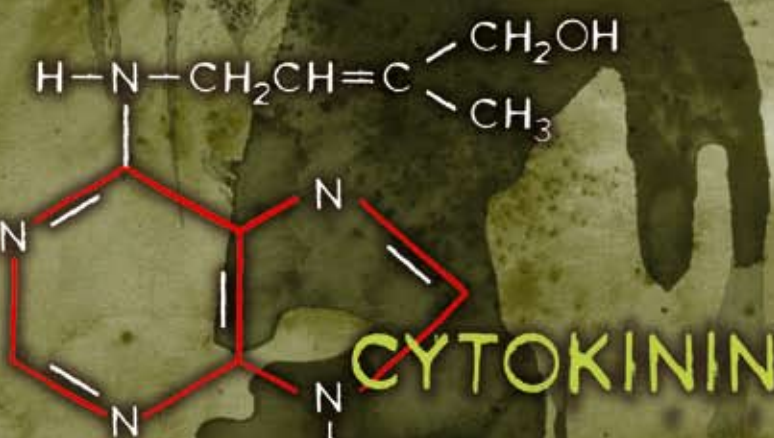
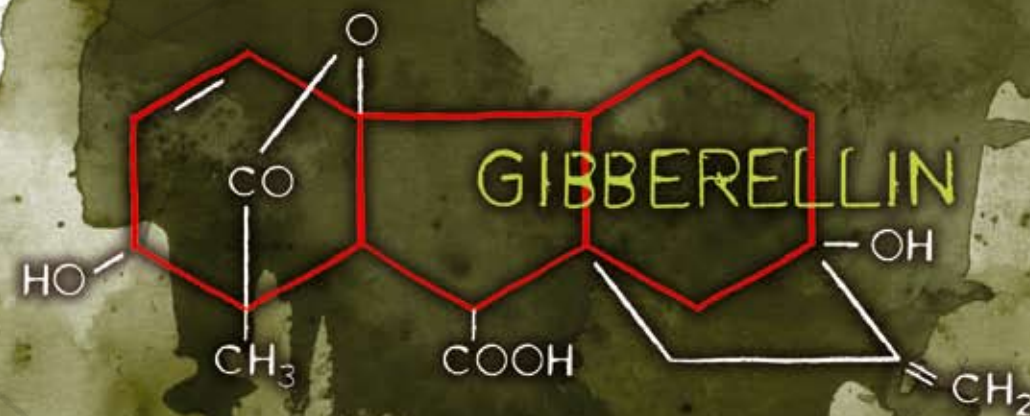
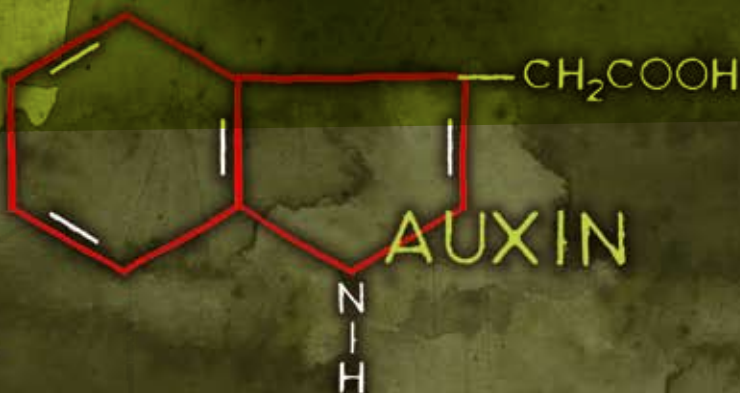
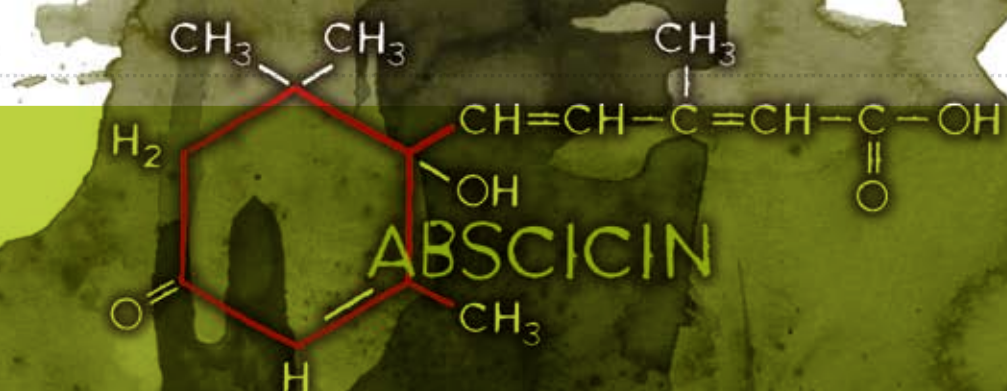


Figure 1: Structural formulae for the five plant hormones.



Photo: CANNA Research: Stem that has torn open because of growing too fast after gibberellin was administered.

They ensure that seeds germinate and flowers form in plants that need long days. Gibberellin is often used in the cultivation of fruit to help unfertilized pears and apples develop fully.

Administering gibberellin to short-day plants, or autumn flowerers, as they are also known, very quickly gives clear effects even at low concentrations. Plants become light green in colour and stems split open because of the fast growth (photo 1). The plant's speed of growth can reach 10 cm per day! Administering gibberellin during the vegetative phase causes plants to start flowering more slowly. Gibberellin is for short-day plants as testosterone is for people. It stimulates the formation of typically male organs and longer plants; longer internodes and male flowers in dioecious plants. When the pollen from these flowers is used to fertilize female flowers, seeds are created that always produce female plants.

Certain environmental influences can also cause the production of extra gibberellin. Plants will make more gibberellin in poorly lighted conditions, which causes them to become long and look lanky. Another effect is seen when the lamp is too close to the plant. Buds that are flowering can start to shoot again if the lamp is too close. This will cause the tops to become long and thin. To prevent this, the distance from the plant to the lamp during flower formation must be at least 50 cm for a 600W lamp.

Cytokinin

Cytokinin activity was first demonstrated in 1913. 30 years later it was discovered that a natural substance present in coconut milk was capable of helping plant cells multiply. Cytokinin was the responsible hormone for this. Cytokinin is known as the hormone responsible for cell division. It stimulates the metabolism and the formation of flowers on side shoots and as such is a counterpart to auxin. The cytokinin concentration is highest in young organs (e.g. seeds, fruits, young leaves and root tips). High concentrations in an organ or tissue will stimulate

the transport of sugars to those tissues or organs. Administering cytokinin leads to greater leaf surface area and faster flower formation. However, the time that flowering finishes is comparable to untreated plants. Cytokinin can be seen as a counterpart to gibberellin in this regard because it stimulates the formation of female flowers on male plants.

Ethylene

The practical use of ethylene comes from the time of Old Egypt when figs were scored to make them ripen faster. In 1934 it was discovered that plants produce ethylene themselves, which enables them to regulate fruit ripening. Ethylene is the least complex plant hormone from the molecular point of view and is produced by all organs. It is a gaseous hormone which is transported via the spaces between plant cells. It is responsible for fruit ripening, inhibition of growth, and leaf abscission (shedding). Ethylene has a stimulating effect on flower formation with certain types of plants (i.e. pineapples, mangoes and lychees). Administering ethylene results in smaller plants

and flowering finishes a lot quicker. The flowers ripen too quickly and consequently remain small. Because plants can be very sensitive to ethylene, the concentration is expressed in parts per billion parts of air (ppb). Concentrations of just 10 ppb can cause abnormalities in tomatoes. In situations where ripening flowers come in contact with young plants there is the risk of accelerated ripening in the young plants. The ethylene that is produced can reach the young plants via the air. Ventilating occasionally (once per day) will remove the ethylene that has formed. High concentrations cause leaves to turn yellow immediately. Ethylene can also accumulate around roots if they are wet for too long. This can lead to leaf chlorosis, stem thickening, leaves bending towards the stem and greater susceptibility to diseases. In stress situations, for example when there is disease present or damage to the plant, the plant produces more ethylene, which causes it to remain smaller and finish flowering faster. Mechanical stress such as air movement can also cause the plants to produce extra ethylene, which will result in smaller plants with thick, sturdier stems. When the fans are too close to the plants there will be too much stress and this will adversely affect the yield.

Abscisin

Abscisin was first isolated in 1963 and has the Latin word abscissio (breaking off) to thank for its name. This is because people thought that abscisin was responsible for the breaking off (shedding) of leaves and fruits, however, it was later shown that ethylene plays a much more direct role in this. Abscisin is produced in the chloroplasts of older leaves and has both inhibiting (growth) and stimulating (protein storage) characteristics. When there is a large supply of abscisin to the growing points of the stem and roots, cell division stops and the plant enters a rest period. Abscisin is an important hormone as far as stress situations are concerned. It is responsible for closing the stomata when the plant is under water stress due to continuing high temperatures, low atmospheric humidity or an EC in the feeding medium that is too high.



Flower formation in short-day plants

Even though a lot of research has already been done into the changeover from growth to flowering in plants, it still hasn't been explained how this mechanism works exactly. In the case of short-day plants, the formation and development of flowers depends on the precise length of the night. Short-day plants will flower when the night-time period is longer than 12 hours. It is important that it is really dark during this period because the plant is only capable of measuring the period of darkness and not the period of light. Almost any light level during the dark phase will affect the cycle. This is measured in the leaves, which then send a signal to the furthestmost ends of the branches instructing them to form flowers. The hormone that gives this signal is called florigen. So it is theoretically possible, for example, to use material from flowering plants to stimulate other plants to flower under 18 hours of light.

Different hormones play an important role in the phase following the first setting of the flower buds. So cytokinin and auxin play an important role in the further formation and growth of the flowers. Abscisin and ethylene are important during ripening.

Using hormone preparations

If you want to experiment with plant hormone preparations, pay close attention to how, when and how much hormone you use. The final effect depends on many factors such as the time of administering (which phase, time of the day), the route chosen for administering (leaf or roots) and the concentration. The final effect of administering hormones can depend very much on the concentration used. For instance: weak concentrations of Auxin stimulate root growth while strong concentrations cause extra ethylene production, which, in turn, causes the plant to finish flowering faster. •



Questions



& ANSWERS

Letters page - our mail box has been flooded with questions, we've made a selection for you here of things we think might be of general interest. Go to www.canna-hydroponics.com and ASK!!! You know the only dumb question is the one you don't ask!

Question

I went to your website to get myself a Feed Chart for CANNA TERRA. In the final flowering phase, I should add water with an EC of 1.3. Now my question is: Do I need to water daily with an EC of 1.3 or only when I change the water? Thanks for the answer, Marco.

Answer

Hello Marco! After week 6 the EC should be lowered again because the plant takes up less and all the rest is waste. 1.3 should do the trick, but when the leaves show burning marks then we advise to flush with only water. We advise a constant feed program and you would use this concentration for the entire stage.



Question

Hi, I bought your CANNA PK 13/14. Do I still need to use CANNA Terra Flores or is PK 13/14 enough?

Answer

Hello, you will still need to use CANNA Terra Flores. PK 13/14 is an additive and not a stand-alone nutrient, although there are some of the same ingredients in CANNA Terra Flores. You need other elements during generative periods (see grow guide). PK 13/14 is basically a nutrient (so it does have an EC) but it only adds 2 main elements, Phosphorous and Potassium, for a short period of time, which is why we call it an additive.

Question

Question for you regarding quality of water: Will using a water filter that rates 99% chlorine and 95% of sediments be good enough? Or is it much better to use an actual reverse osmosis machine? I am asking because the RO machine costs 5x as much. But if the difference is significant, I will do it. I'm growing in soil with organics. Many thanks!

Answer

Hello, thanks for the question. These are 2 different functions. The filter can remove the chlorine in the water, while RO removes salts from the water. If toxic levels of chlorine are an issue, but the starting EC is low then the filter will do fine (sometimes just letting the tank sit full for 24 hours will also do the job as long as the chlorine has been added using the older method of chlorinating water with the gas chlorine dioxide. It is not effective if the chlorine is supplied by chloramines which would require RO). If the EC of the tap water is above 0.4 or 400 ppm, then it might be a good idea to use an RO set-up and mix the RO water back with the tap water to get a starting EC of about 0.2 or 200 ppm. This will mean bigger savings over time than using straight RO water. CANNA recommends starting with no less than 0.2 or 200 ppm in source water. If the EC is much below this bring up the start EC first. Filtering out sediment is important for equipment such as drippers, lines, pumps, tanks, etc. It is also a requirement for RO since you do not want sediments blocking the RO filters or clogging up the lines and high-pressure pumps in the system.

Do I need to water daily with an EC of 1.5 or only

Hello, thanks for the

Question

Hi, when using the BIOCANNA nutes, I'm wondering if it's a problem when you tip the bottle upside down, that you see a thick liquid stuck to the bottom of the bottle. Is that a problem? I don't know, but I put the bottle in hot water to soften the residue, so then I can shake it up, just wondering if it makes a difference or not? Thanks

Answer

Hello, The thick brown stuff in the bottle is known as vinasse. This holds about 50% of the nutrient load for the nutrient. It is important to shake the bottle well before each and every use of the product. DO NOT apply the vinasse to the plant, as you will burn it. If you are near the end of the bottle and are not shaking the bottle well each time, then you can burn the plant. In this case I advise you to dispose of the remainder, get a new bottle and start again. This time follow the label directions and shake well. Turn the bottle upside down, with the cap on, and shake it, which will get it into suspension faster.

Question

Can you tell me what the pH level is for the CANNA Coco 50L bags? Does adding the nutrients (A+B) raise or lower the pH? Thanks, Jim

Answer

Hello Jim, CANNA's Buffered Coco has an initial pH around 6.1. The tendency is for the medium to drift lower. The Coco A/B nutrients will increase the pH, but only a little. The combined effect on pH is a buffering activity that gently maintains a steady pH while allowing the plant to move soil solution pH to where it wants it at any given time in the plant's daily routine.



Question

I would like to know the difference between your Terra Professional Plus and Bio Terra Plus. I've noticed both of them don't have any perlite. So it is not immediately obvious what the difference is. Thank you for your help in this matter. Kind Regards, Mark .

Answer

Hi Mark, Thank you for your question. CANNA Terra Professional Plus differs from Bio Terra Plus in that it is specially designed to work with our CANNA TERRA nutrients whereas Bio Terra Plus is designed for organic growing in combination with our BIOCANNA nutes. Combining Bio Terra Plus and TERRA nutrients (or Terra Professional Plus with BIOCANNA nutes) has proven to work as well. But if you wish to grow 100% truly organic, Bio Terra Plus combined with BIOCANNA nutes is your choice. Furthermore Terra Professional Plus is most suitable for indoor growing, especially when using drippers. Bio Terra Plus can be used both in- and outdoors and because of its self regulating capacity, it is most suitable for growers who manually water their plants. Hopefully this answers your question.

Question

Hi. This is my first time using any CANNA products. Just started 12-hour using TERRA Flores with CANNAZYM & CANNA RHIZOTONIC 3 weeks ago and at week 5 I will try PK13-14. I have a 4x28L pot, 50 liter Res, re-circulating system with 1/3 clay and 2/3 perlite using RO water. The last flush was done at the start of the 12-hour light cycle, 3 weeks ago. What is your recommended flushing cycle for vegetative & flowering period? Cheers, David

Answer

Hi David, To begin, you do not really want to recirculate any nutrient on CEC mediums like Peat or mineral clay soils. The medium tends to affect the ratio of the nutrients across time. It will also increase your need to leach (the correct word) at times during the crop cycle. Leaching is done to decrease soluble salts in the medium or to correct ratio issues. This is best accomplished by using no less than an EC of 0.2 (200 ppm) since it takes more desired salts like Calcium to knock out the less desired ones like Sodium. It has to be immediately followed up with a normal feeding. Flushing is the erasing of the EC from the medium to force the plant to use the remaining nutrients it has in the pipelines just prior to harvest in order to remove less desired tastes and increase quality. This can be done with RO water about 3-5 days prior to harvest, whichever works best for you. No additional feeding is done after this.



MILDEW

THE CONTINUING STORY

OIDIUM & MILDEW (PART II) BY INAKI GARCIA

In previous issue of CANNATALK, I discussed some of the Oidia that can attack your plants. I want to discuss another one, the fungus *Leveillula taurica*, in this issue. This Oidium differs from the others mainly in two aspects: while *Sphaerotheca macularis* and *Trichothecium roseum* only penetrate the surface layers of the plants, *L. taurica* colonizes areas further in. The result is that unlike the other Oidia, when you run your finger over the typical “powder”, it doesn’t come off altogether or leaves a mark on the leaf. In addition, whereas the conidiophores (the parts of the mycelium in which the reproductive spores –or conidia– are located) of the fungi *S. macularis* and *T. roseum* grow on the surface in the mycelium that is produced, the conidiophores of *L. taurica* emerge through the stomata of the plant, which are located mainly on the back of the leaves. Symptoms vary greatly, depending on the species on which they live. Under the microscope, *L. taurica* can be distinguished from *S. macularis* by the morphology of the conidia and conidiophores, and by the emergence of the conidiophores through the stomata. Remember that the stomata are mostly located on the back, so you might notice a whitish felt running round the leaf. There is very little information available on the factors that affect this species in hop plants. Although this phytopathogenic affects around 700 different species, the principal studies carried out have been on hop plants.

These studies have observed that the conidia germinate at temperatures of between 50°F and 95°F (10- 35°C), with the optimal temperature being 68°F (20°C). More extreme conditions (6 hours at 104°F (40°C) significantly reduce the viability of the spores (meaning that in very warm areas there is a smaller chance of infection in summer). It has previously been noted that the fungus needs climatic variations to develop its full cycle and this is also the case here. While the optimal temperature for germination is 68°F (20°C), no new spores form in infected plants at higher temperatures; however the optimum temperature for growth of the mycelium is between 59°F (15 - 25°C). As for relative humidity levels, the most favourable conditions for germination are a daytime figure of

between 85% and 95% and also very humid nights. Although high levels of humidity favour germination, they also hinder development of the mycelium. It is easy to see that the best way of ensuring that plants don’t become infected is by taking preventative treatment when the average temperature is between 50°F and 95°F (10-35°C) and when relative humidity remains high both day and night (e.g. during long periods of rain or constant daytime showers, etc.). If your indoor plant has already become infected (whether the symptoms are visible or not), you should make sure to keep the temperature and humidity constant without sudden variations. By keeping the temperature as high as possible (without impairing development of the plant) you will help prevent the formation of new spores and

hinder growth of the mycelium, thus slowing or stopping the disease from spreading. You should also regularly use natural fungicide treatments. This will prevent the new spores that would spread the disease from forming or make them less viable. At the same time, it will hinder growth of the fungus, thus helping the natural fungicide act more effectively.

Toxicity of the Oidium

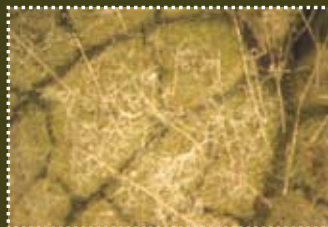
Turning to the intrinsic toxicity of the oidium fungi that attack the hop, *L. taurica* and *S. macularis* do not produce toxins that might be considered dangerous for human health. However, don’t forget about false

powdery mildew or pink Oidium, which even advanced growers find difficult to distinguish from the real thing. Scientific studies have been carried out to try to establish the differences between the two fungi on hop so they can be safely identified. This pink oidium, *Trichothecium roseum*, produces a number of micotoxins which are highly toxic in mammals. Studies carried out in 1969 shows that extracts of this fungus at different levels of concentration were capable of killing mice, rabbits and even 19-day-old pigs, as well as causing other injuries. Given how dangerous this fungus is, you should obviously do everything in your power to prevent the development of Oidium on your plants rather than taking the risk of consuming contaminated plants.

Figure 1: When you run your finger over the typical powder of *Leveillula taurica* on the back side of the leaf, it doesn’t come off altogether or leaves a mark on the leaf.



Sphaerotheca macularis
infection in strawberries.



Leveillula taurica



Pseudoperonospora
cannabina



Photographs: Karna Maj

MILDEW

Mildew is the term used for two fungi that cause this disease in hop plants, *Pseudoperonospora humuli* and *Pseudoperonospora cannabina*. Because the former is a major problem on hop plants, plenty of information is available on it; though there is hardly any literature on its development in hop in particular.

In any case, these mildews are so similar that knowing their symptoms and behaviour in hops, we can get a good picture of the effects in hop. As the disease spreads, the leaves curl up, necrotise and end up falling off. The parts of the mycelium containing the spores of this fungus emerge through the stomata of the plant. In good light it can readily be identified as a grey to purple felt on the back of the leaves.

Cold nights (around 50°F / 10°C) with very high humidity (over 85% relative humidity) provide ideal conditions for the formation of the sporangia (the structures containing the spores). Once the spores of these fungi reach the leaves, they need very high levels of humidity or even free water (rain, dew, etc.) to germinate and penetrate through the natural gaps in the leaf (lenticels and stomata). One feature of the spores of these fungi is that they have little hairs (flagella) which make them mobile; for this reason they are known as zoospores. The sporangia need free water to release the spores, which can move through water using their flagella. As a result, this fungus occurs certain times of the year and in areas with prolonged rainfall. The spores are also scattered on the wind. Spores form by night and day, but are released during daytime. Optimal temperatures for infection are normally between 61°F and 72°F (16-22°C). Once the plant has been infected, development of the fungus is favoured by alternating day-time and night-time temperatures. The optimum daytime and night-time temperatures for development of the fungus are 77°F and 59°F (25 and 15°C) respectively.

Unlike Oidia, mildew-type fungi are affected more by copper-based preparations than sulphur-based ones. Because it spreads to the internal layers of the plant, you should try to control it using fungicides with a systemic effect, such as monopotassium phosphite.

Preparing a customised prevention strategy

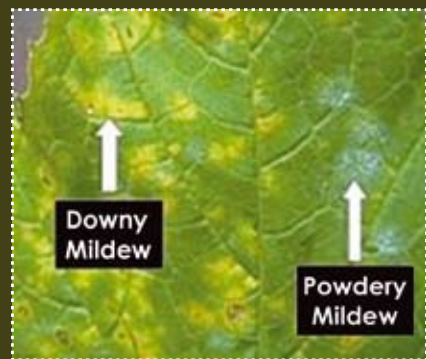
In deciding on the best prevention strategy for combating the fungi that might attack your plants in particular, you should consider the weak points of the attacking fungus during each phase of the infection process.

As a grower, you want to keep your plants clean and free from any parasitic fungus at all times. It is therefore essential to prevent the inoculum (any part of the fungus that might cause an infection) reaching your plant. That is why we will analyse the factors that make the fungus (primarily its spores) visit our crops.

We have already seen that the greater the quantity of spores in the air, the greater the chance that your plant will become infected. For indoor plants, it is a very good idea to feed filtered air to the plants instead of extracting it. For outdoor plants, however, you will have to establish the optimal temperature and humidity range when there is the biggest quantity of spores in the air. These spores may come from a number of sources in the nearby area: horticultural and ornamental plants, weeds, waste material, other plants

like yours, etc. They will mostly be carried on the wind, though you may be responsible for transporting some of the spores yourself, on clothes, hair, etc. Rain is another factor to take into account; as these two articles have shown, there are some fungi whose spores can be spread by water running off the leaves whereas other fungi are actually harmed by these conditions. In other cases rainfall also favours the spread of the fungi; and not just rain but water that gets on the leaves during irrigation (splashing, etc.)

LOCATION OF THE MYCELIUM	MICROSCOPIC DIAGNOSIS	SPORULATION	OTHER CHARACTERISTICS	FUNGUS
On the upper and underside of leaves. Yellow spots can appear on the upper leaf surface	The conidiophores arise from the stomata (underside of the leaf), they are wire-shaped with a conidium at the end		When you brush your finger lightly over the mycelium, it leaves a stain behind	<i>Leveillula taurica</i> Common name: powdery mildew
On the upper side of the leaf	The conidiophores arise from the mycelium (on the upper side of the leaf), they are wire-shaped with the conidia forming a chain, like prayer beads		When you brush your finger lightly over the mycelium, it disappears	<i>Sphaerotheca macularis</i> Common name: powdery mildew
On the upper side of the leaf and on stems	The conidiophores cannot be distinguished		In later stages of development, presents a pink colour Associated with secretions from other pests (aphids, whiteflies, etc.)	<i>Trichothecium roseum</i> Common name: pink rot
Grey mycelium underside of leaves	Sticking out of the stomata (underside of leaves), branching threads with some dark areas (sporangia) on the ends		Yellow spots occur between the veins that can turn brown in colour Causes curling of the leaves	<i>Pseudoperonospora cannabina</i> Common name: downy mildew



You should also bear in mind that certain environmental factors can damage the inoculum or reduce its chances of survival (e.g. temperatures of over 104°F (40°C) for a period of 6 hours reduce the viability of the *L. taurica* conidia). Lastly, you need to understand very well where the inoculum prefers to germinate and develop. For example, we have seen that *T. roseum* begins its development on waste matter such as sticky remains and excretions from pests such as white fly, plant lice, accumulations of pollen, dust, etc. Other fungi germinate directly on the plant. By keeping a plant free of pests that secrete sticky substances and other wastes, you can help prevent *T. roseum*, but not other fungi. You should also remove any plants that are not part of your crop that might host parasitic fungi.

Should the inoculum manage to come into contact with your plants despite your best efforts, all is not lost; the conditions may not be right and it may be possible to avoid germination of the spores. The most important factor is the humidity. For all fungi it is vital to know the optimum humidity levels for germination. Some fungi prefer pools of water whereas others are harmed by them. The next most important factor is the temperature at which the spores germinate. As we have seen, in extreme temperatures (at certain times of the day in the summer or winter months) many of these fungi cannot germinate. However, in the case of indoor plants where you are trying to maintain a mild temperature, this is a disadvantage. Finally, there are many substances of natural origin that hinder germination of these fungi, so a basic part of your strategy should include preventative application of organic fungicides. There are other products that, instead of actually preventing germination, stop the germ tube from entering the plant. For example, some fungi take advantage of the natural irregularities in the cuticle to penetrate the internal tissues. Others, on the other hand, force their way into the cuticle. In both cases, the use of oils may be helpful since they provide an extra barrier against which the fungi have to fight. There are also products that reinforce the cell walls, giving the cell greater mechanical resistance. For example, extract of Common Horsetail (*Equisetum arvense*) contains, among other substances, silicates that perform this strengthening function.

Of course you won't know that you haven't done enough to prevent the fungus from invading and colonising your plants until the first symptoms appear. A long time can pass between penetration of the inoculum in the plant and the appearance of the first symptoms (this is called the incubation period). During this time the plants may appear to be perfectly healthy, but the fungus is silently securing its position inside. It is therefore important to keep up the fungicide treatments even if you can see no trace of fungus; the fact that you can't see it doesn't mean it isn't there.

In these circumstances, you will have to radically change your strategy, concentrating on deciding on the best products for eradicating the pathogen or at least slowing down its development. One thing you should bear in mind is that in general, these types of phytopathogenic fungi have different optimum temperature and humidity levels for germination, dispersion and growth of the pathogen. This explains why the most important fungal attack takes place in months when the weather is mild but there are major variations in temperature and humidity, especially in the spring and autumn. If your plants are already infected, you should determine the best environmental conditions for growth of the pathogen, and in case of indoor plants, always try to keep the plants in regular conditions of temperature and humidity with no sudden changes — if possible under conditions that will hinder growth of the pathogen.

Of course, none of this will be of any use at all if you don't know what fungus you're fighting against; it is essential to identify its biological cycle and the optimal conditions for its development so that you make life as difficult as possible for it. In this way you can use other tactics apart from fungicides (like filtering the interior air). If you do have to use fungicides, use natural ones where possible. You can limit their use and save money by knowing your enemy's weakest moments. •

a word from
a CROWER

GROWERS

TALK

Hi there CANNA,

I've been reading CANNATALK for a while and I must say I love it! It's informative and fun to read. The best thing is actually that you don't have to go searching for a bit of growing info between all the advertisers that dominate most magazines in the industry nowadays. Kudos for keeping it straight and to the point! The only thing I'm missing out on, is a word from a female grower. We're also out there you know!! That's why I decided to write you; to hearten all those female growers out there.

My experience in growing started out about 5 years ago. Fed up with all the high fruit and veggie prices I decided to grow my own. I started out with tomatoes as I figured that little could go wrong cultivating tomatoes. Boy, what a false assumption.... Out of my 5 plants, I could only harvest like 10 really small tomatoes. This did not discourage me, in fact it made me even more determined to do it better next time.

Instead of asking my family and friends for some advice, I searched the net to collect all information which I thought I needed to make my next grow a huge success. But the net is full of idiots who think they know best. So where to start and what to believe? My local gardening store recommended me CANNA but I wanted to think about it because it is quite expensive. So I went to visit your website first. The thing I found very useful, is that I had the possibility to create my own Feed Chart customized to my growing method, circumstances and needs. So that's what I did and that's what convinced me to try the products too.

I decided to give my tomatoes another try, using CANNA's Terra Pro Plus potting mix and nutrients as the shop owner told me TERRA is a program that enforces each others components to get the best result in the easiest way (Thank you guys for 1-part nutes). Guess what! At harvest time I could collect more tomatoes than I could possibly eat myself. I finally did it!! I was worth every penny!

After growing tomatoes, I also grew my own peppers,



both sweet and chilli, cucumbers and basil but still using CANNA.

So thank you CANNA!

You can even make
an experienced grower
out of a woman!

Cheerio, Anne





What's NEW

NOW AVAILABLE: ENRICHED CANNABOOST

CANNABOOST, the powerful flowering and metabolic stimulator by CANNA, has changed; it now performs better than it did, and it supports a longer shelf life.

Improved performance & prolonged shelf-life

CANNA is constantly looking at ways to improve existing lines and introduce important new products. After the initial success and ever increasing demand for CANNABOOST since its introduction, we are pleased to announce that CANNA Research succeeded in ameliorating an already outstanding product by further improving its characteristics.

Research and testing has now shown that by increasing one of the nutritive elements in CANNABOOST, several positive effects are enjoyed. First, it allows CANNABOOST to work faster and with more effect. Second, it also acts as a preservative and has increased the products shelf life from one year to two years when stored under normal conditions.

Product Label

Keep using CANNABOOST as before; nothing will change as to its use or application. The only visible change is the product label which now reflects the NPK changed to 0 – 1 – 1 by the additional enrichment. However, this doesn't change the way it is used or the rate at which it is used. CANNABOOST still increases the plant's energy pathways, especially in its ability to convert light energy into chemical energy, assuring fruits form quicker and produce more sugars. It can still be used in any cultivation method and is suitable for tank mixing, manual application and as a foliar spray. It's actually the same product but better!



What's HAPPENING



BURNING MAN

By Bianca Bakkers

Once every now and then an annual festival originates from a spontaneous gathering of like-minded people. This is also what happened with Burning Man. It started out in 1986 on Baker Beach in San Francisco where a bonfire to celebrate Summer Solstice turned into a festival in the Black Rock Desert, Nevada with about 50.000 attendees. Here the first wooden man including a smaller wooden dog were burned. The wooden man was "only" 8 ft (2.4 m) tall, the latest creations go up to 40 ft (12m) on a pedestal of about the same height. It was the first act of "radical self expression" which would become one of the most important characteristics of the festival.



Photography: Shane Kruitbosch

BURNING MAN

History

As years go by and the number of people visiting the festival increased every time Baker Beach in San Francisco could no longer be the venue for this ritual. Also because the authorities forbade the burning of the statue because of the potential fire hazard.

It was then decided, in 1990, to leave San Francisco and find another venue. Also the date of the event changed. It would now take place the weekend before Labor Day (first Monday of September). The new venue was found in the Black Rock Desert, situated north of Reno, Nevada. There is a playa, a dried lake bed encircled by a mountain range, it is the second largest and flattest part of the United States. The city that is being created by the visitors is called Black Rock City. This city only exists for a certain period each year. After the participants have left, the city also ceases to exist.

The festival grows every year and in 1995 CNN starts its first coverage. This is also the first year participants are required to buy a ticket to attend. Tickets cost \$35 at that time. The year after Burning Man got its first theme: Helco. Participants are encouraged to create art works, music, moving vehicles that correspond with the theme. Tickets nowadays vary in price from about \$200 to \$300, mostly depending on the time of purchase, as early bird discounts apply.

Characteristics

Burning Man is also a festival with some rare characteristics. It is all about **radical self-expression, radical self-reliance, art and community sense**. So you may express yourself in words, music, art, clothes (or the absence of them), or any other way you find suitable. It is also a strictly non-commercial festival, meaning there is no vending and therefore no money is required. The only exception being coffee and ice which can be purchased as much as you want.

As the festival takes place in the middle of the desert at the end of the summer, it can be pretty hot (temperatures of over 100 degrees Fahrenheit = about 40°C), but the nights can already get nearly freezing cold. It can also be very windy, resulting in dust everywhere and even in sand storms. So be prepared! As there are no shops on site, it is a **BYO-party**. And make sure you bring enough!! Everything you did not bring you may get from your neighbour, maybe you have something for him/her in return! This is one of the other characteristics of Burning Man: The art of gift giving. Giving without expecting something in return.

Another important characteristic is the one of Leaving no Trace. All waste that is being created by all participants during the entire week of Burning Man, should also be taken home by all participants. This is something very important to consider when going there!! During the festival there is a Recycle Camp, where you can dispose of your aluminium cans. Better yet: bring your own mug!

Rules

All in all, there are many rules at Burning Man. Leaving no Trace is the most important one. Another important one is that photographing or video making is not allowed unless your camera or video is registered beforehand. This is the only conflicting issue we see with the Burning Man principles.

Car free

The Festival is a no-go area for motorised vehicles, other than the Mutant Vehicles that are part of the Art Scene. You can park your car, RV or motorcycle near your tent/sleeping place and leave it there for the duration of your visit. To go around the City to visit the playa or the Theme Camps, use a bike or your feet! As mentioned earlier the festival has a theme. For 2010 the theme is Metropolis: The life of cities. Theme Camps exist since 1993 at Burning Man. These are the interactive core of Burning Man. There aren't many rules, but there is one big principle however: A theme camp must be participatory. The best camps succeed by simplicity. In a hot, windy environment nobody is interested in Powerpoint presentations, lengthy/boring storytelling or heavy debating. As there is absolutely no electricity available, participants with Theme Camps should be totally self supporting, so generating their own electricity (by using wind and/ or sun) having their own build-up equipment and of course water!

International festival

Throughout the years Burning Man did not only grow in visitor numbers, it also grew geographically. Visitors from all over the world are attending the festival and Burning Man now has a year-round network of over 150 local contacts in locations all around the world (regionals.burningman.com).

So all in all, for all those free spirits out there, Burning Man Festival is surely something worth considering spending your holidays on. So get your sunblock out, buy a ticket and go!! •

Photography: Waldemar Horwat



Photography: Steven Fritz





Disasters

dissolved

Potassium is found throughout the whole plant. It is necessary for all the activities having to do with water transport, the opening and closing of the stomata, and many other things. Potassium takes care of the strength and the quality of the plant, and controls countless other processes such as carbohydrate systems. Higher potassium content in the soil increases the plant cells' resistance to pathogens. The Romans and the Etruscans enriched the soil with potassium by burning the local vegetation. This form of slash-and-burn farming has taken place for centuries over the whole world, with extreme soil erosion as a consequence.

POTASSIUM SHORTAGE

During the thirties, a mixture of wood ash and manure was still used in Western Europe. Potassium is a soft silver-white metal that, in pure form, reacts violently when it comes into contact with air and water. 300 million years ago minerals such as potassium, sodium and magnesium were dissolved into the sea by crust erosion. The sea water in large sea beds evaporated and the salt crystallized and generally covered by more rock leaving salt formations. Until around the turn of the 20th century, only kitchen salt was extracted from these formations. The rest of the potassium was discharged into the rivers or back into the environment. Thanks to the development of inorganic fertilizers, other minerals, such as magnesium, sulfur, phosphorus and boron are now mined besides table salt.

Deficiency

Evaporation from the leaves is reduced, and subsequent water movement through the plant is reduced as well, if there is a shortage of potassium.

A consequence of this is that the temperature in the leaves will increase and the cells will burn. This occurs mostly on the edges of the leaves where, normally, evaporation is highest. Temperatures within a leaf can rise dramatically, not only from the ambient air temperatures, but also from the radiation from the sun or light source that a leaf's tissue collects. An internal temperature above 104°F (40°C) is destructive to the plant because proteins will be broken down. The leaves do cool due to evaporation, but this requires energy. Seventy percent (70%) of the plant's energy is used by this evaporation process.

It must be noted that dead edges of the leaves can also appear when there is a lack of humidity, or general salt burn. It is impossible to recognize a potassium deficiency just based on these symptoms. In general, one could state that when 10% of an element is missing in the plant's tissue, the appearance will be visible, and can be recognized by a change of color and/or necroses and other signs.



Stage 1

Stage 2

Stage 3

Development of a DEFICIENCY

- I. In the beginning, you see a healthy-looking, dark green(!) plant with normal glossy leaves. The leaves lose their luster (cuticle thinning) later on.
- II. The plants often have more branches, but the stalks remain thin.
- III. The tips of the younger leaves show grey edges; later they turn rust-brown, and curl up and dry out.
- IV. The leaves turn yellow from the edge in the direction of the veins, and rusty-colored dead spots appear in the leaves.
- V. The tips of the leaves curl up radially, and entire sections of the leaves begin to die out. The leaves keep on curling and ultimately fall off (older leaves).
- VI. An extreme shortage produces meager, unhealthy-looking plants with strongly reduced flowering.

3. An excess of 'kitchen salt' (sodium) in the root environment - Sodium slows down potassium intake. Sodium accumulates easily within the root environment, normally more sodium is available than the plant needs. A high sodium level can be caused by poor water quality, salinated soil, the wrong compost or nutrients, and recirculation systems.

Solutions to resolve a deficiency

- Go to your garden shop for expert advice. They have the right products available and a correctly formulated fertilizer contains sufficient potassium.
- In case the EC (electrical conductivity) of the substrate or soil is high, you can rinse it with clean water.
- You can add potassium yourself; the easiest way is inorganic. Dissolve 5-10 grams of potassium nitrate in 10 liters of water. In acidic soils, you can add potassium bicarbonate or potassium hydroxide (5ml in 10 liters of water).
- You can add potassium organically through a water solution of chicken manure or slurry of manure (be careful not to burn the roots) and wood ash (contains several pH-increasing minerals like potassium, (K₂CO₃) calcium and magnesium. Ash works well as a fertilizer on acid soils). Extracts of the grape family also contain high amounts of potassium.

Recovery

Potassium is absorbed quickly and easily by the plant. In a hydroponic environment, improvement will be visible within several days. In soil, it will depend on the absorption capability of the soil; in which case it might become necessary to increase the dosage. Potassium supplementation by leaf fertilization is recommended.

Too much potassium will cause salt damage, calcium and magnesium deficiencies and acidification of the root environment.

Reasons for a deficiency

1. Too little, or the wrong type of fertilizer
2. Growing in potassium-fixated soils - Humus and rich clay soils have a strong, mineral-binding working, and buffer especially cations like potassium. Therefore some nutrients are temporarily not available to the plant. Because of the shorter growth period of fast growing plants, this can present problems.



AQUAPONICS

Aquaponics is essentially organic cultivation of plants and animals together in a re-circulating closed system

(water tank), using water instead of potting mixes. Technically speaking it is a combination of aquaculture (fish

farming) and hydroponics (soil-less plant culture). Although there are currently a limited number of commercial

aquaponic operators, many people are expressing a strong interest in this intensive method of food production.



Plant cuttings can be composted in a wormery (simplest definition is a container that holds worms and is used to compost) to provide food for the fish. The nutrient-rich water that results from a build-up of fish waste (feces, urine and urea) which can become toxic to the fish are converted by beneficial bacteria in the water into nitrites and then harmless nitrates which are used by plants as a natural fertilizer. As the plants consume these nutrients, they help to filter the water that the fish live in. The clean water is returned to the aquatic animal environment and the cycle continues. It is a closed loop system with minimum impact on the environment. The system produces fast growing and succulent vegetable and fruit crops while also providing fish. Aquaponics is a sustainable, fun and simple way to produce excellent quality food for your community or for sale commercially. The system relies on the smooth functioning of the natural ecosystem created in the water tank. Water is only added to replace water loss from absorption by plants, evaporation into the air or the removal of biomass from the system.

This system is efficient, uses up little space and does not require lots of extra water. The fish provide all the nutrients needed by the plants so no fertilizer is required. Because the plants grow in water there are no weeds and so herbicide is not needed either. The daily water use is minimal and a large volume of food crops can be grown using much less space when compared to growing crops in a field. Aquaponics can be produced locally, year round and with consistent cropping. Aquaponics can be set up in urban areas supplying food to local markets, in dry regions with poor soil, in developing countries, in rural communities or anywhere else that fresh food is needed. Aquaponic systems vary in size, from small indoor units to large commercial units. They can use fresh or salt water depending on the type of aquatic animal and vegetation being grown. Aquaponics has the potential to provide a profitable and sustainable business especially for the production of high-value crops to a network of established outlets. It cannot compete on a wholesale level with commercial hydroponics, or with intensive aquaculture, but aquaponics fulfils a niche market of sustainable local food production.

Hydroponics methods used

1. Deep Water Circulation (DWC) or Floating Raft Culture

This is used with large-scale systems, where there is an extensive crop area and high levels of fish stocks. Plants are grown in a media such as Rockwool or Coir and are then transplanted into net pots which fit into holes cut out of a floating polystyrene raft.

The polystyrene insulates the water and excludes light which reduces algal growth. The water is aerated by an air pump, compressor or regenerative blower to ensure the water is sufficiently oxygenated to allow the roots to assimilate the nutrients rather than simply rotting away.

2. Nutrient Film Technique (NFT)

A thin film of water is continually circulated down a gully or gutter type system. Plants are then grown in pots which fit into holes in the NFT channels, bathed by a constant flow of nutrient-rich water.

3. Grow beds (media filled)

One of the simplest aquaponic methods in use is grow beds coupled with fish tanks and a pumped flow. Grow beds can be filled with lightweight clay balls (lightweight, pH buffered, and aids in aeration) or gravel (lower cost alternative). Standpipes, auto-siphons and pre-filters can all be incorporated into the design where appropriate.

The key to looking after the aquaculture (fish) is to look after the water quality. Healthy fish stocks are maintained by making sure the water is clean, well aerated, at the



correct temperature and adequate food is available for the fish. Careful husbandry and monitoring will ensure a productive and a stress-free environment for your fish and will ensure that they thrive and breed.

Lettuce, chives and other leafy crops were first considered for aquaponics but, more recently, commercial growers and researchers have had great success with tomatoes, cucumbers, peppers, melons, flowers, strawberries, and herbs (basil, mint, wheatgrass, chives, oregano, sage, parsley). Tilapia is a fresh water fish that is fast growing and has firm white meat when filleted. It is most commonly raised in aquaponics because it can tolerate a wide variety of water quality conditions. Other fish, such as crappie, brim, bass, carp, trout, goldfish and koi can also be raised in this system.

Advantages of aquaponic food production

- uses the nutrient-rich water from aquaculture that otherwise would have been a waste product
- eliminates the cost and time involved in mixing traditional hydroponic nutrients
- provides a truly organic form of nutrients for the plants
- produces an organic product (no fertilizer or herbicides used)
- no soil-borne disease as there is no soil
- no water is wasted or consumed by weeds
- relatively small spaces required as plant spacing can be intensive
- plants grow and develop relatively quickly
- crops can be grown all year-round. In most climates a greenhouse is required

The number of fish you can stock in your tank depends on the size of the tank and the type of filtration system in use. In an aquarium-based system, stock the tank at 1" (of fish length) per 3.5 liters of water. In larger systems, commercial growers usually stock the tank to a maximum of 1/2 lb of fish per 3.5 liters of water.

The number of plants you can grow depends on the number of fish in the tank, their relative size and the amount of fish food added daily. In general, 1 sq. meter of plants in raft Aquaponics can grow for every 60-100 grams of fish food added per day, Commercially, aquaponics is still in its infancy but, as the technology develops and is refined, it has the potential to be a more efficient and space-saving method of growing fish, vegetables and herbs. Not everyone can make a success of this business – you must have the correct equipment, have the technical know-how to grow plants and raise fish, and be a good manager and marketing specialist! •



Grower's TIP

Stock Plant Rotation

The biggest mistake many growers make is in thinking that the plants they keep and use for cuttings, crop and crop again and Stock Plants can be used indefinitely. This is not true! Stock plants, referred sometimes erroneously in this industry to as Mother Plants, that are maintained properly, cut properly, and watched closely, will last for several rounds of cuttings. The process of removing the dominant shoot as a cutting, and the resulting breaking of this dominance in axillary buds through hormone floods, tend to wear on the genetics of the new plant that forms as the dormant bud 'breaks' and starts the new tip. Other than being connected to the same root system, this is a new plant and there is every possibility that some genetic change has occurred. Some of the most important advancements in plant varieties has occurred in this fashion from new 'sports' found from bud breaks on older varieties. The more genetically variable the plant is the faster this can occur. Usually, however, this process results in a weakening of the plant overall in vitality, size, or quality. To avoid this, plan and change out old stock plants with new stock plants, on a regular basis, based on the plant in question, after a determined number of harvesting dates.

Always harvest and trim the entire plant to maintain control and cutting size. Always take appropriate cuttings at the point where the Carbon Nitrogen balance is right, not too green nor too woody. Use correct pruning techniques on the stock plant: while it is great to have large numbers of cuttings from one plant, it is more important to have less that are healthy and consistent in size and quality. This can only occur by looking at the plant and which buds will break on the cut, selecting those, and then removing the ones that you do not want.

HOW TO Grow Panic Pete





Mini VEGGIES

In the last issue of CANNAtalk, we brought you the first article in this series, which talked about growing mini sweet peppers. We promised you more mini-crops, and this time we focus on mini-cucumbers ...because the more you know the more you can grow!!

Cucumber

Cucumbers grow on cucumber vines as annual twigs with stems. The vines can either be grown on the ground or tied upright, but upright vines grow better and produce a greater yield. Cucumber vines grow in a rampant fashion, with their roots spreading very wide but very superficially. Cultivated cucumbers vines have only female flowers which turn into fruits, meaning that fructification happens parthenocarpy – without the production of seed. A lot of these mini-cucumbers carry several fruits per leaf axil. Breeders talk about single-fruited, semi-multi fruited or multi-fruited cucumbers. The fruits may be mini, but the leaves certainly aren't! Mini-cucumber plants have large leaves, which cover over the fruits. The cucumbers are just like the ones we are all familiar with, with their smooth skin. There were once also cucumbers with a bumpy surface.

Origin

The cucumber family or Cucurbitaceae, to which gherkins, melons and pumpkins also belong, are mainly seen in the tropics. Cucumbers originate from India, from where they found their way to the Mediterranean region. Cucurbitaceae is one of the most important food-producing plant families, and was already being cultivated by the Egyptians 3000 years ago. The Romans brought the cucumber to France and for a long time cucumbers were grown in Europe as an ornamental veggie because of their bizarre shapes. The cucumber is another 'vegetable' which strictly speaking is a fruit, like tomatoes, sweet peppers and chilli peppers. Since 1960, this warmth-loving plant has been grown under glass in the Netherlands. This means that cucumbers are available all year round. The fruits can be harvested when they are dark green. But they can be yellow or white as well!

Qualities

Cucumbers are low in calories and high in vitamin C and water, which makes them the perfect food for anyone watching their weight! Their high fibre content helps your digestion. Raw cucumber is delicious as sandwich filling, in salads or as a snack. The cucumber is the perfect vegetable for a healthy diet. Cucumbers are also very good for the skin!

Cultivation and cooking

To grow the best cucumbers, you'll need to consider the following:

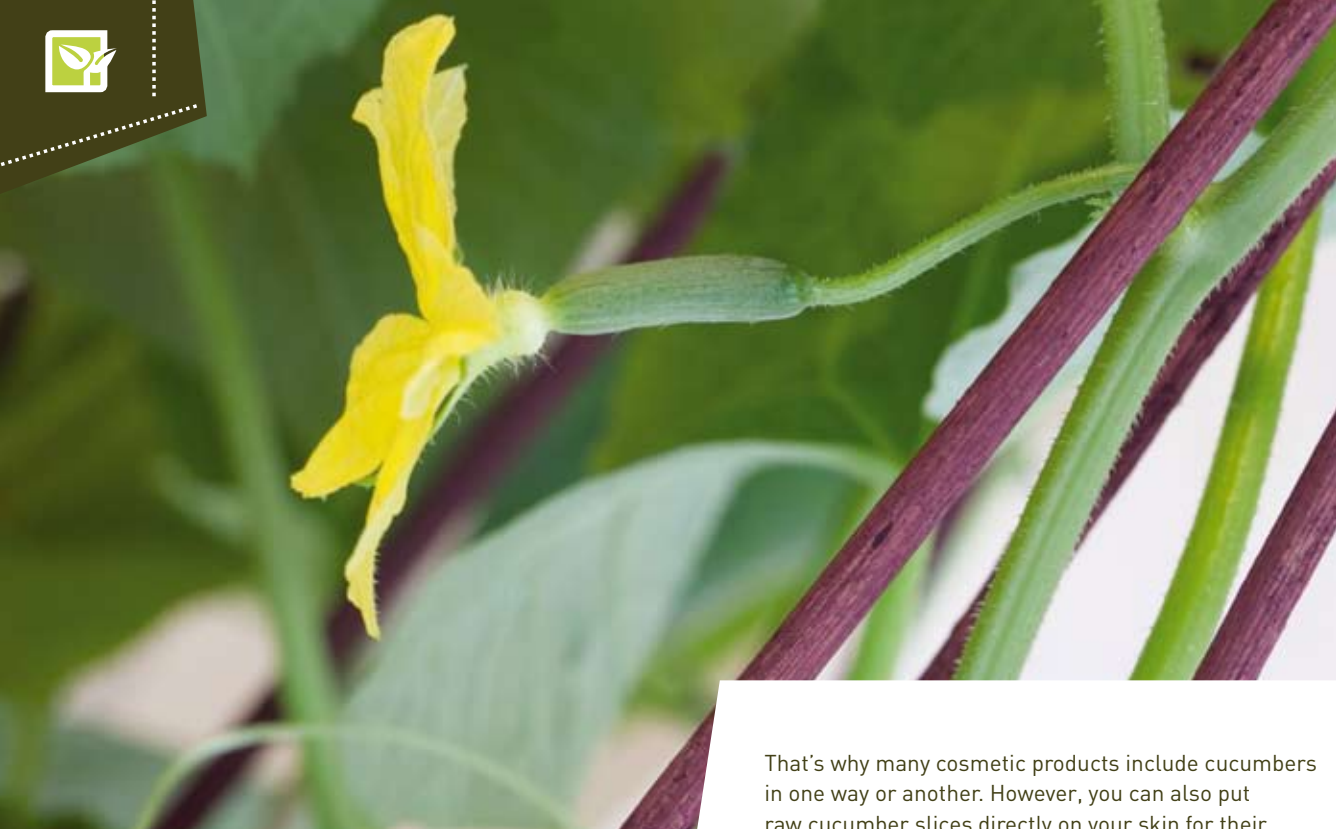
- For lighted indoor cultivation, the temperature should be a constant 68°F / 20°C.
- Do not use moist potting mix.
- Cucumbers love warmth, so be careful not to let them get cold. But also make sure you do not overdo the heating, because they can easily dehydrate.
- Cucumbers need a lot of water. But do not water the leaves, because this can cause nasty mildew. Do not let your cucumber plants stand in water – they do not like wet feet! Make sure any excess water is drained off immediately.
- Since cucumbers love warmth, it is best to grow them indoors.

It doesn't take long to talk about how to cook cucumbers: they are eaten raw and usually sliced in salads. Cucumbers are often combined with tomatoes or lettuce, and sometimes onions or cheese. In the tropics, cucumbers are often eaten cooked and added to warm soups or stews.

Mini CUCUMBERS!



Photographs: Anton van Dongen



- Mini-cucumbers hold more multiple fruits per leaf axil than regular cucumbers.
- Do not harvest your mini-cucumbers late, otherwise they will grow so fat that they won't be mini-cucumbers any more!
- Growing mini-cucumbers does not mean the plants are mini as well!
- Because the fruits stay small, the plant's fruit load is less than with regular cucumbers.
- The smallest mini-cucumbers are 10cm long, the longest are 18cm.
- Cucumbers are very low in calories, so they make a perfect snack.
- Both Fusarium and Mildew can be a problem when cultivating mini-cucumbers.
- Peeling cucumbers isn't really necessary. The peel is fine to eat.
- Cucumbers from Mediterranean countries taste different to cucumbers grown in a greenhouse.
- There are also yellow and white varieties of cucumbers.
- Cucumbers are said to stimulate your sex life because of their suggestive shape!

Storage

Tarator

Preparation: Peel the cucumbers. Blend one cucumber with the yoghurt in a food processor. Cut the second cucumber into small pieces. Clean the herbs, peel the garlic and chop both finely. Mix all the ingredients thoroughly with the walnuts and serve with bread.

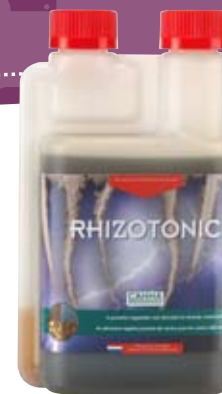
Is it true that a cucumber is not a vegetable?

Absolutely correct. To most people, a cucumber is a vegetable, but botanists call it a fruit because it is the fruiting part of the plant. They also call tomatoes, aubergines, chilli peppers and sweet peppers fruits. •



Rules Samurai:

* the prizes are composed by CANNA, no exchanges for money or other products.
Your personal information will always be handled with confidentiality and care.

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WHAT'S NEXT

Next issue of CANNATALK will be more or less of a theme issue where the central theme will focus on roots. The root zone is of vital importance for your plants and can be detrimental for your harvest if anything is wrong in the zone. You'll find a scientific article about our Research departments' findings on this subject as well as grower's tips and other facts about Roots and what they tell you once you start to read them. So make sure not to miss it. It might just answer the question to your root issue.



Snowkiting



The What's happening section features a piece on Snow Kiting; an upcoming sport amongst dare devils, snow freaks, kite junkies and board babes. It's fun, it's exciting and maybe it's your new obsession?



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CANNAtalk

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CANNAZYM

NEW FORMULA



CANNAZYM NEW FORMULA

CANNAZYM has been improved! While it still continues to be the only enzyme product targeting the underlying cause of root binding, old cast-off and dead root material, the new formula made some major changes. New formula CANNAZYM increases the activity of enzymes on cellulose while decreasing the time it takes to work. CANNAZYM is now a darker shade of liquid from the increased concentration of enzymes. It now boasts a better resistance to temperature extremes, which prevents destruction of the enzymes. Best of all, it now has an extended shelf life. All this means a better product all around. For more information, or to obtain the evidence of this products' effects, visit our website or your local gardening center and download or pickup the New CANNAZYM leaflet.