ucf Undercover farming

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Job 37:6-10

"For to the snow He says, 'Fall on the earth,' and to the downpour and the rain, 'Be strong.'

"He seals the hand of every man, that all men may know His work. "Then the beast goes into its lair and remains in its den."

ucf Undercover farming

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INSIDE ...

Survival is currently the most often discussed subject by food producers. The question arises; what has happened to a free and fair trade and production system, without glitches like electrical and water supply shortages, dysfunctional export systems and other curtailments towards progress in food production? South Africa for many decades was on the forefront of quality produce, continuous flow towards markets and exports of note to many foreign destinations? Do we have to blame the 'wheel and deal' players in politics and foreign suppliers only? Napoleon Hill wrote a book, 'Think and grow rich'. It is possibly time as role-players in agriculture to look beyond the current barriers. New technologies like electronification, solarisation and a myriad of latest, well-researched and trialled technologies are available to producers. It is a question of good financial planning, utilizing every possible strategy in the business and moreover, obtaining finance from the right institution. Government can no more 'look the other way' when it comes to export taxes, no assistance towards energy, water, fuel and fertilizer costs in agriculture in the broad. Neighbouring state governments are all assisting producers with these important input expenses so their production levels can increase. We would like our government to look into these aspects and not fall behind their neighbours. With winter on hand, growers juggle their climate control, water supplies and possible greenhouse plant pests. We do our best to publish editorial content of relevance to the current season and hope this will stir feedback to the editor from producers who wish to know more on these subjects. Happy reading!

RIJK ZWAAN STARTS BREEDING SOFT FRUIT

Rijk Zwaan has been active in vegetable breeding since its foundation in 1924. The company is now launching a new breeding programme for soft fruit, aimed at broadening its product portfolio with strawberries, blackberries and raspberries. Construction work for a new greenhouse at Rijk Zwaan's facility in Dinteloord (the Netherlands) marks the official start of the soft fruit breeding programme.

Rijk Zwaan has expanded considerably over the past 30 years. This latest investment in soft fruit breeding represents a continuation of the company's strategy of autonomous growth.

Soft fruit breeding programme

Breeding Manager Pieter Egelmeers explains: "Soft fruit is traditionally propagated vegetatively rather than from seeds. We are focusing on both in our breeding programme. Building on our knowledge of research, breeding and seed production, we hope to bring new and innovative strawberry, blackberry and raspberry varieties to the market that will of course add value for growers and other chain partners."

Market-ready varieties

On average, it can take between 6 and 16 years to breed a new variety. "We are still at the very beginning of our soft fruit breeding programme, so it is too early to say when Rijk Zwaan's first soft fruit varieties will be ready to market," says Egelmeers.

New greenhouse

The facilities for the soft fruit breeding programme will be housed in a new building, which entails the construction of a greenhouse plus office. The new building is an extension of Rijk Zwaan's existing facility in Dinteloord.

Construction work officially started on Tuesday 18 April, in the presence of Kees Reinink (Board Member) and Anton van Doornmalen (Chairman of the Supervisory Board and co-owner of Rijk Zwaan). The work is expected to be completed in 2024.

RIJK ZWAAN
Sharing a healthy future

TOGETHER WITH OUR PARTNERS...

we actively contribute to the world's food supply and stimulate vegetable consumption by laying the foundations for healthy and appealing vegetables.

RIJK ZWAAN

Sharing a healthy future

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IMBALI CUT FLOWERS STILL GOING STRONG AFTER 35 YEARS

Marcus Henkel is an architect but in 1988 quit his architectural practice and started farming on a property which was in the family since 1968. After researching various options like chickens and pigs, he decided on cut flowers, thanks to the encouragement from acquaintances in the flower industry.

After some thorough research it was decided to grow Gypsophilla, which at the time was fetching good prices and was relatively cheap to establish. The first two greenhouses of 1800 m² were welded up by him single-handedly at his home in Pretoria. The first plants, imported from Israel, were planted in July 1988 and the first crop was harvested in November 1988. The profits were used to expand the business, which now comprises 7 greenhouses totalling 2 hectares. In 2001 it was decided to change the crop to Gerberas. The input costs are much higher than Gypsophilla but at the time, the returns were good. In 2013 Marcus's daughter Tania, joined the business.

Gerbera remains a popular flower type in South Africa but Imbali do not export Gerberas as they do not transport well. Unlike other flowers, they must be picked at the open stage, as once they are picked; they will not open any further.

This means they cannot be tightly packed into a box, resulting in the shipping costs being much higher than the cost of the flower itself. Therefore, the company relies entirely on the local market.

Gerbera is definitely not a hardy flower. While its lineage is from the Barberton Daisy, it is a man-made plant from the laboratory environment. This makes them fussy flowers that are extremely sensitive to any and all elements, resulting in high costs of growing.

"The flowers are grown in pots off the ground in coco peat. This allows us complete control over the nutrients each plant receives. If one plant is sick, we can easily remove it without infecting the whole crop. We use drip irrigation, which is primarily the most eco-friendly way of watering, ensuring the least wastage, and secondly ensures the plant itself stays dry, as overhead sprinklers leave marks on the flowers and encourage growth of Botrytis. We are in the process of moving over to an entirely biological pest management system, and are experimenting with companion plants (i.e. plants that attract good predators) and predators, as well as biological sprays," Tania explained.

"We have a growing area of 1.7ha of Gerberas in 7 greenhouses. We keep our Gerbera plants for 4 to 9 years. The ideal is to replace some plants every year, with the idea that plants would be a maximum of 6 years old, but unfortunately this is not always financially possible. This means that we have full

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greenhouses all year round."

"Our top issues we deal with are Powdery Mildew, Two-Spotted Mite, Leaf Miner and White Fly. At the moment we have four greenhouses under an Integrated Pest Management system of biological and chemical sprays and fogs. The remaining three are fully biological with predators. The transition is taking time, but with huge success. The aim is a significant savings on chemicals and biological products, and easing the spray team's burden. Pests have become resistant to most chemicals, so it has become a world-wide necessity to find alternatives."

"Load shedding has wreaked havoc on the industry. We spent a small fortune on a generator, only to run our irrigations. As a result our fans, wet walls and vents are not running when they should, which cause a decline in plant health, production and pest outbreaks due to irregular greenhouse climates."

Tania said she has a team of 23 staff, including herself. She does not often use temporary staff, but when necessary, she first hires spouses of existing staff who live on the property. "When we do have a vacancy (which is rarely given the current business climate), it is extremely difficult to find people who are willing to work. Many do not want to do manual work, and there is a stigma around being a "farm worker".

When the unemployment statistics are published, I always wonder how many of the people could be employed, but just don't want to be. Unfortunately, South Africa has created a 'hand-out' mentality. People have told me they would rather receive a tiny grant for nothing, than work for minimum wage."

"We are proud to have two very long-term employees – our longest is Tryphinah Mphogo. She is the 'magogo' of the team, and definitely an example of doing things right. The second is Sam Ramonyai. He is like family to us. He is 'all about' Imbali and without him I can't even think of that! He is the maintenance manager. He started in 1991 as a young man, and grew up with Imbali. He knows every square inch of our farm!"

"We are not looking at building more greenhouses for Gerberas. As we don't export, we have to make sure we don't over saturate the local market. With load shedding, minimum wage increases, the world-wide shortage of fertilizers and the exchange rate making it very expensive to import plants and growing medium, there is no positive outlook for expansion."

"Over the past 35 years in the cut flower industry, we are proud to still exist but can only ascribe our success to diligent management, hardworking staff and production of top quality flowers. "We are one of four Gerbera growers on the Multiflora Flower Market," Tania Henkel concluded.

Heating pipes running through a greenhouses system to ensure stable temperature.

A LOOK AT GREENHOUSE HEATING SYSTEMS

At the beginning of the cold season, the question irrevocably comes up: Why Heat a Greenhouse?

Automated screen systems are available to retain or let out excessive heat.

Heating a greenhouse is to sustain plants and the growth of it year round. There are many different styles and sizes of heater and heating system available.

Heating systems that are available ranges from Air heaters, Diesel heaters – both direct fired and indirect fired, Heat-pumps and for hot water heating and under soil warming cables for the propagation of seedlings and cuttings.

Air Heat systems:
Hot air heating can be done through indirect or direct diesel heaters, Fanjet heaters with heating elements or, even using a coal fired air boiler, which is commonly used in the tobacco industry to dry leaves.

The hot air of these heaters is normally distributed through plastic ducting, which are punched/perforated according to the distance travelled and the volume of air flow.

For the small or beginner greenhouse operator a 3kw or 5kw fan heaters for small greenhouses are quite adequate.

Hot water heating:
The main advantage of hot water heating is that it distributes the heat evenly throughout the greenhouse. The energy source can be a boiler powered by a combustion diesel burner or, it can be a coal fired boiler.

It can also be a heat pump system that is very energy efficient and requires less maintenance. The heat is controlled via a thermostat and a 3 way valve which controls the hot and cold water inlets into the system.

Under soil warming for plant propagation and cuttings
Under-floor heating cables are available, ranging in size from 3 square meters up to 27 square meters that is controlled via a thermostat for optimum root heating. This ensures a healthy and viable seedling. A heat pump system for multiple propagation areas can also

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be effectively be used. This is usually installed by a professionally trained team of installers.

Heating in professionals greenhouses

Open-buffer
Every situation demands a precise and complete analysis of the heating equipment requirements, according to the type of crops, the type of greenhouse (tunnel or glass greenhouse), the equipment and the geographical location.

Every production system has individual needs and therefor requires a study and particular design for an applicable heating system to achieve optimal performance for the growth of a crop, while also optimising energy consumption.

Examples of available systems
Highly innovative, low-temperature condensing heating is available to South African greenhouse farmers. A boiler which is cost-efficient, easy to install and highly energy-efficient, makes it suitable for vegetable growing and horticulture production.

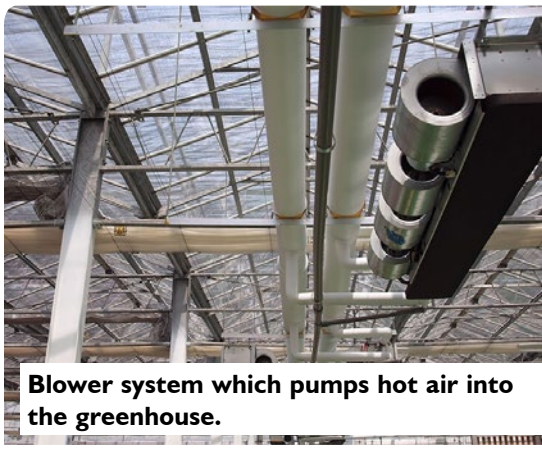
Made up of several stainless steel heat exchangers, each unit is capable of offering a wide range of loads and output temperatures, thereby guaranteeing heat production.

Heating the greenhouse
Heat is most often produced by installing burners, boilers and condensers. The use of heat pumps, exchangers fuelled by a source of hot industrial water, geothermal sources or co-generation engines allows the overall energy costs of production in greenhouses to be optimised.

Gas and CO^2 heating
Greenhouse heating with CO^2, produced exclusively by gas boilers or gas engines fumes is treated in order to recover the CO^2, which is then transferred to the greenhouse through a PVC distribution network, and then fed to the plants through a micro-perforated duct.

Sous-stations
A transport system and relay points made up of substations are necessary to evenly transfer the hot water produced by the boilers to the various parts of the greenhouse.

Emitters
Greenhouse heating transmitter rail tubes, growth tubes, Tichelmann loops, de-icing tubes and unit heaters make up the various heat transmitters in a heated greenhouse.



Blower system which pumps hot air into the greenhouse.

A water heating system using electricity or gas.

Retractable screens
In order to regulate climate in a greenhouse, electronically managed screens can be installed. This is a major asset to greenhouse operators at it reads the ambient temperature, is fed with the particular crops' temperature needs and opens to let out excess heat and also closes when outside temperature drops to retain heat, or at least keep the inside temperature at an even keel. This system saves on energy, prevents human error and ensures plants flourish throughout their life with the correct temperature.

Hot water tank
A greenhouse hot water tank is designed according to the open-buffer principle for a hot water tank. This tanks acts as an expansion chamber and energy store (water at 90°C). It is used to inject the CO2 produced by the combustion of the gas in the greenhouse, thereby boosting photosynthesis. This hot water tank is also used to store energy for use at the coldest times of day.

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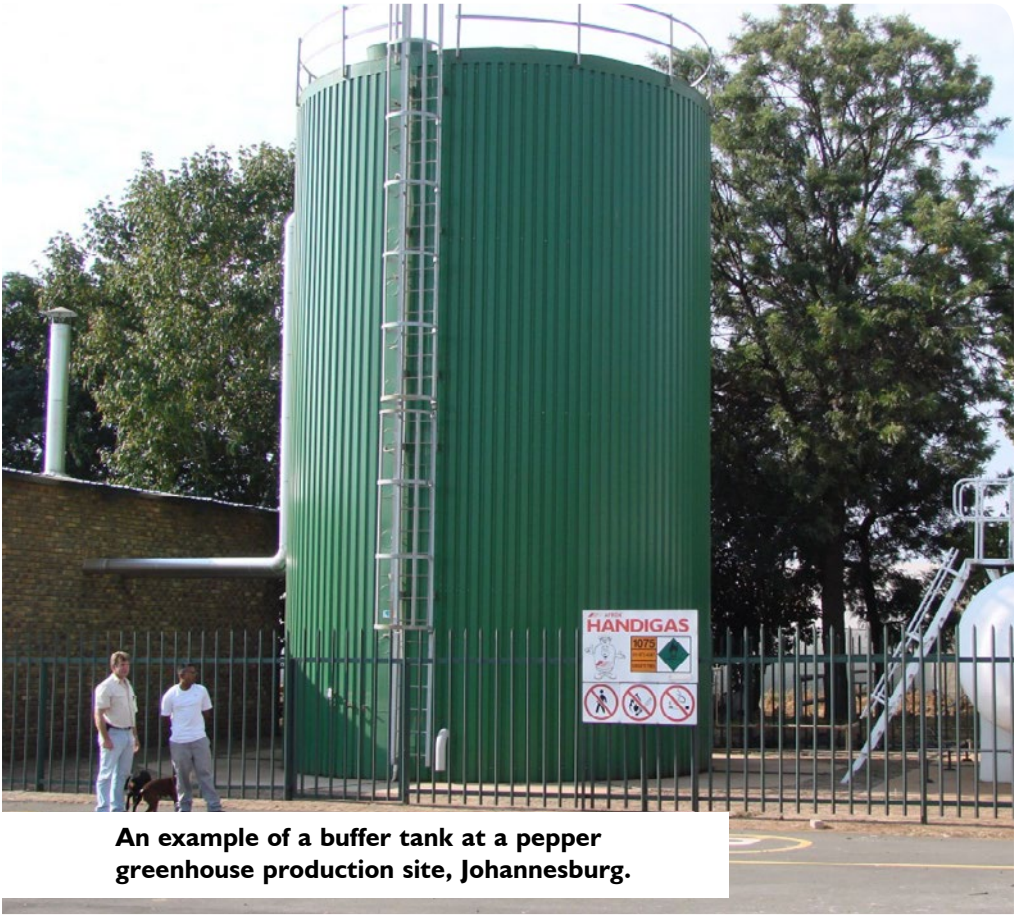

An example of a buffer tank at a pepper greenhouse production site, Johannesburg.

THE SCARE OF *PYTHIUM* DISEASES IN GREENHOUSE CROPS

Pythium species are fungal-like organisms (Oomycetes), commonly referred to as water molds, which naturally exist in soil and water as saprophytes, feeding on organic matter. Some *Pythium* species can cause serious diseases on greenhouse vegetable crops resulting in significant crop losses.

Pythium infection leads to damping off in seedlings and crown and root rot of mature plants. Several *Pythium* species, including *P. aphanidermatum, P. irregulare* and *P. ultimum*, are known to cause damping-off and crown and root rot in greenhouse cucumber, pepper and tomato crops.

There are no *Pythium* resistant varieties available although some varieties may have disease tolerance. Over watering, poor root aeration, root injury and improper root zone temperatures can weaken the crop and, thus, trigger *Pythium* outbreaks. Saturated growing media that are either too cold or too warm can be conducive to *Pythium* build up and spread in water and recirculating nutrient solution. Plants grown under optimal environmental conditions are less susceptible to *Pythium* than plants grown under poor conditions.

Disease cycle

Pythium can be introduced into a greenhouse in plug transplants, soil, growing media, plant refuse and irrigation water. Greenhouse insects such as fungus gnats (*Bradysia impatiens*) and shore flies (*Scatella stagnalis*) can also carry *Pythium*. *Pythium* spreads by forming sporangia, sack-like structures, each releasing hundreds of swimming zoospores (Figure 1). Zoospores that reach the plant root surface encyst, germinate and colonize the root tissue by producing fine thread-like structures of hyphae, collectively called mycelium.

These hyphae release hydrolytic enzymes to destroy the root tissue and absorb nutrients as a food source. *Pythium* forms oospores and chlamydospores on decaying plant roots which can survive prolonged adverse conditions in soil, greenhouse growing media and water, leading to subsequent infections.

Symptoms

'Pre-emergence' damping-off causes seeds and young seedlings to rot before they emerge from the growing medium, while 'post-emergence' damping off kills newly emerged seedlings. In 'postemergence' damping-off, the pathogen causes a water-soaked, soft brown lesion at the stem base, near the soil line, that pinches off the stem causing the seedling to topple over and die. In mature plants, *Pythium* causes crown and root rot, where plants suddenly wilt when weather turns warm and sunny and when plants have their first heavy fruit load.

Often, upper leaves of infected plants wilt in the day and recover overnight but plants eventually die. In the root system, initial symptoms appear as brown to dark-brown lesions on root tips and feeder roots and, as the disease progresses, symptoms of soft, brown

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THE GAUTENG UNDERCOVER FARMING CONFERENCE AND EXPO 2023

The Undercover Farming Conference & Expo that was presented on the 21st and 22nd of February was yet again a successful event that attracted over 124 attendees from across the country. The two day event offered seminars and discussions exploring the latest trends in the industry, as well as newly emerging technology and its various applications. In addition to the educational opportunities, there were also networking sessions for industry professionals and exhibitors showcasing their equipment and products.

Objectives
The primary objective for this event was to educate the audience on the latest techniques and processes relevant to the undercover farming industry, while providing a platform for networking with like-minded individuals.

Undercover Farming Expo also focused to provide an opportunity for exhibitors to showcase their products and services related to this field and to make valuable connections that could pave the way for new relationships moving forward.

Keynote Speakers
Prominent speakers from around the world that are experts in the field of undercover farming was invited to speak on a variety of topics related to this industry. These speakers provided valuable insights into their respective areas of expertise, such as the quality of technology with which greenhouse producers in Southern Africa run their operations successfully and their continuous expansion.

Further, a focus session on the hemp industry in South Africa proved to be an extremely valuable topic of discussion for many of the attendees, and presented delegates with constructive input on the way forward in the hemp industry in South Africa.

Participants were also able to engage with experts, allowing for deeper conversations about key elements within the industry like soil nutrition, crop rotation, and integrated pest management. These sessions offered something for everyone, regardless of their background or experience level.

Exhibitors
Exhibitors are an integral part of any event. Not only do they provide attendees with the latest products, services, and information that may be of interest to them, but they also help create a vibrant atmosphere. This year's expo was an opportunity for exhibitors to showcase their products or services related to undercover farming. Exhibitors such as DubeTradeport, Dynatrade, Test.It, Ezolimo Organics, APAC, Delphy, and Haifa had the chance to demonstrate their cutting edge technologies and solutions for producers in the sector, as well as make vital connections with potential customers or business partners.

Overall, the Undercover Farming Conference & Expo was a great success. We are proud of the results and would like to thank everyone who attended for their participation, enthusiasm, and support.

We look forward to our Undercover Farming Conference & Expo Western Cape, event held on the 18th and 19th of October 2023 at Allee Bleue Wine Estate, with even more networking opportunities and informative discussions in store, Marion Oosthuizen, Organiser of the event concluded.

By: Cynthia van Straten

▶ THE SCARE OF PYTHIUM FROM P 10

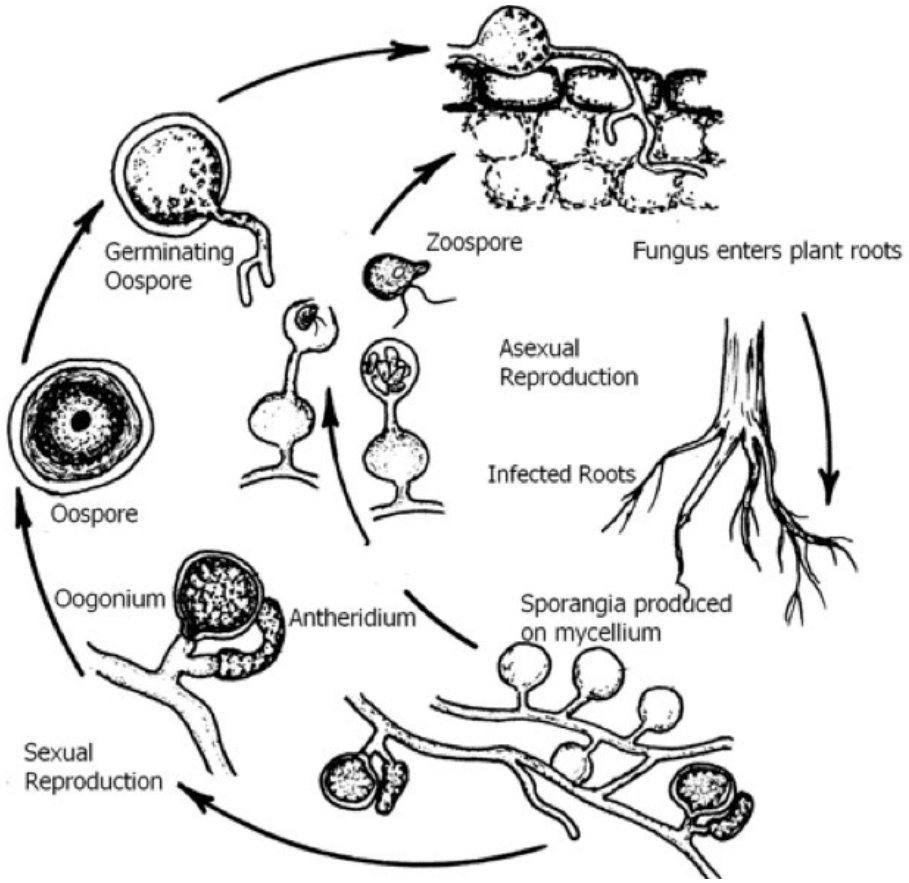

Figure 1. The disease cycle of Pythium damping-off and crown and root rot of greenhouse vegetable crops.

Figure 2. Pythium crown and root rot in greenhouse cucumber showing orange discolouration of the crown area and rotted roots and root tips.

stubby roots, lacking feeder roots, become visible (Figure 2).

In larger roots, the outer root tissue or cortex peels away leaving the string-like vascular bundles underneath. *Pythium* rot also occurs in the crown tissue at the stem base. In cucumber, diseased crown turns orange-brown in colour, often with a soft rot at the base; brownish lesions extending 10 cm up the stem base may be seen.

Monitoring & Identification
Routinely monitor your crop for slightly wilted plants and check wet areas in the greenhouse where *Pythium* is more likely to be present. *Pythium* occurs mostly in spring, at early fruit set and later in the season on mature plants. In cucumber, *Pythium* can also occur in the summer on young plants brought in for the fall crop. Monitor plants for wilting, and in cucumber, check the stem bases for discoloration. Always confirm *Pythium* diseases by sending representative plant samples with roots, crowns and foliage to a plant diagnostic laboratory.

Integrated Disease Management
Disease management consists of a combination of cultural, biological and chemical tools to control and/or manage crop diseases effectively. Cultural controls keep *Pythium* from reaching the roots while biological and chemical controls inhibit or suppress *Pythium* in the root zone.

Sanitation: Field soil, debris, pond and stream water, and roots and plant refuse of previous crops can contain *Pythium*. Follow a strict greenhouse sanitation program throughout the year and a thorough year-end clean up. Clean and disinfest all interior greenhouse surfaces and equipment including tools, hoses, walkways, carts, totes, troughs, tanks and water supply lines. Use sterile propagating media. Remove dying plants by placing them directly into plastic bags for disposal away from the greenhouse.

Irrigation water: Untreated water from rivers or streams poses great risk for *Pythium* introduction, while treated municipal water is considered safe from *Pythium*. Water storage and nutrient tanks need to be disinfected periodically and covered to prevent *Pythium* contamination.

Resistant varieties: Although there are no resistant vegetable varieties, some vigorous varieties may have some tolerance to *Pythium*. Contact your local seed/seedling supplier for further information on *Pythium* tolerant varieties.

Biological and Chemical Control
Prevent *Pythium* diseases by practicing integrated disease management strategies based on cultural and biological controls. Use fungicides as a last resort at the onset of disease. Rotate registered fungicides with different chemical groups and strictly follow label directions to avoid resistance development in *Pythium*.

Routinely monitor plants and evaluate the level of disease control if fungicides are used. Stop fungicide treatment and get professional advice if fungicides fail.
Source: W.U. Plant Biology.

SA BLUEBERRY PRODUCERS FRUSTRATED BY CHINESE MARKET: LOOKING AT INDIA AND ISRAEL MARKETS OFF TO A GOOD START

Justin Mudge, blueberry farmer and chair of the board of BerriesZA for the past four years, believes that a stratified berry industry has been gathered together by BerriesZA, coalescing around common problems like the chemical application and registration process. This he says, is an absolute struggle or the status quo at South Africa's ports, of which he has been an outspoken critic.

"Undoubtedly we face a massive collective challenge. Something like the port strike last year, where I was particularly vocal, also created more of a common understanding that you need a mouthpiece for industry and you can't do this alone, "said Justin.

Elzette Schutte, operational manager of BerriesZA explains: "There has not been a real change in the number of blueberry growers, but we experienced an increase in the associated membership, with more exporters and nurseries joining the industry."

Chinese import needs

In 5 years the total Chinese blueberry needs far exceed the entire South African crop. Therefore, the industry hopes to have India and Israel open to them during the season ahead.

"Market access is such a slow-burning fuse," Justin remarks, "but we are getting good support and working well with the Department of Agriculture, Land Reform and Rural Development."

China is the market we really want opened: the country is predicting a need for 10,000 containers of blueberries a year out of the Southern Hemisphere in five years' time. "That equates to 10 x the current South African exports," he says.

"If we continue on the current route [of no access into China] that opportunity will pass us by and those blueberries will be produced elsewhere in the Southern Hemisphere and South Africa will allow others to effectively eat our lunch."

More price mechanisms required

Everyone planted everything everywhere, with very little predictor of success, Justin explains, and the industry has seen a lot of casualties through varieties that didn't perform in certain regions or routes to market that were not well understood.

Only those at the top end of efficiency thrive, which is why South Africa has to be more focused about how their fruit is marketed into Europe.

"I would say because of the traditional stratification there is an overconcentration of marketing avenues through too few channels into Europe. We need to recognize that Europe is diverse and requires a diversity of supply chains to service their individual requirements."

He explains that production surges, especially of highly perishable products like blueberries, require a mechanism with which to flush them through the market, but that has been missing. Blueberries across the border Namibia and Zimbabwe have emerged as blueberry growers in tandem with South Africa and the potential for overlap is there, but relative to the overlap with their Peruvian counterparts, it's insignificant and should be no issues if product is positioned well.

Justin Mudge on Chiltern Farms in the Theewaterskloof. This is a family farm, annually packing 1.5 million cartons of pome fruit and 3,000 tons of blueberries. (photo supplied)

"Wider supply from Southern Africa is a positive in my view; it targets the region as a production area with a wide range of availability. Zimbabwean supply is kicking off even now. It gives us a long reach. We're actively engaging with Namibia and Zimbabwe to at least understand how we can cooperate on issues of common interest and share information."

An area of common interest is the in-efficiency at South African ports, and Justin tells of the heavy traffic of ships rounding the Cape of Good Hope, but bypassing ports which have become known for its unjustified delays.

The heavy traffic of ships rounding the Cape of Good Hope, bypasses ports which have become known for its delays.

Nevertheless, he maintains that there is a real and present opportunity for berry farming in South Africa.

"The contextual environment in which growers operate, will ultimately determine whether we're able to seize the opportunity or not. What producers are asking for is an opportunity for leverage and to seize their rightful place in the market," concluded Mudge.

Source: Berries ZA (Original text written by Carolize Jansen for Fresh Plaza.

Beneficiaries and workers of the NWU's SUNfarming project busy nurturing their vegetables.

AGRIVOLTAIC FARMING:

Will Solar Power have Undercover Farming take a new turn?

All farming operations are somehow curtailed by the failure of a steady electricity supply. A few greenhouse producers already resorted to solar energy, but can this become the 'new norm'?

Agriculture plays a major part in our economy, livelihood, and the environment. Solar technology along with traditional farming holds numerous benefits and enables farms to become self-sustaining, increasing crop yields and reducing electricity and water consumption. It is the future, using solar technology together with traditional farming.

Even in 1981, Armin Zastrow and Adolf Goetzberger, came up with the idea of using the same area of land, for both crops and solar energy – a synergy between crops and solar. They coined the term 'agrivoltaics' by combining "agriculture" and "photovoltaics" for the positioning of solar panels above productive agricultural land, maximizing land use. Akira Nagashima took it to the next level by developing the first prototypes in Japan in 2004.

Advantages of Solar Energy

It is found that there are many advantages of agrivoltaics, such as sustainability, increased food, and energy production. It adds to the rehabilitation of damaged land, improves the microclimate of the farming process and the social impact on communities. To be able to achieve this, the system must be strategically positioned and laid out, by considering the type and nature of the crops.

Technically speaking, the tilt angle of the solar module is the main concern when placing PV modules. There are three typical setups; Interspersed between crops, Raised and tilted panels and of course, Greenhouse arrangements

Functioning

Solar panels that are placed over crops give shade to low-light plants. The solar module arrangement and placement will transmit partial light and will protect the crops from possible light-related damage and in turn, the plants cool the solar system when they perspire. Placing the modules over the crops also allows the sun's energy to be used twice; for the growth of the crops and to generate electricity, which can be used on the farm to power irrigation, agriculture equipment and refrigeration, meeting the demands of the farm. By using renewable energies farmers support their livestock's health with the improvement of the local air quality.

Photovoltaic arrays produce much less carbon dioxide and pollutant greenhouse gas emissions than the traditional farms of power generation. The dual use in agriculture and energy production could mitigate competition for land resources, minimizing the pressure to transform open land into farms, preserving biodiversity.

Challenges

The key challenges are the initial investment expenditure for installations, but the financial benefits do pay off over time. More concerning are the uncertainties due to a lack of clear policies. The need for specialized equipment and skilled workers also poses a problem. Over past years, companies in South Africa geared themselves for introducing solar energy to farms and along with agricultural and science institutions, executed trials to find answers to the exact needs of different farming operations.

South Africa has great potential for the implementation of agrivoltaics with its huge farming culture. The conditions in South Africa are highly suitable for the large-scale implementation with its plentiful farmland that can be reconstructed for agrivoltaics. The country's favourable climate and sunny conditions are ideal. By reducing evaporation, water-scarce regions will benefit, helping to reduce water usage and water losses – aiding the conservation of this precious resource. Crops in South Africa that prefer partially shaded conditions include tomatoes, beans, lettuce, potatoes, certain grape varieties, hops, spinach, and legumes.

Solar Energy and your crops

One example of an agrivoltaics installation in South Africa, is the SUNFarming installation in Potchefstroom, harnessing the power of solar. The trial project began in 2016, and produced tomatoes, spinach, cauliflower and other herbs. The project is made up of three solar tunnels/greenhouses, vegetables and greens are grown in grow media and drip irrigation is used to water the crops. The solar tunnels produce much higher yields when compared to conventional farming. In partnership with the University of Potchefstroom, the first solar training centre in South Africa was established in 2013, which provides the necessary skills for PV technology.

Solar panels have to sometimes be elevated or suspended to allow plants to grow beneath them. Another option is putting them on the roofs of greenhouses. This allows enough light and rainwater to reach the crops, as well as providing access for farm machinery.

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MANAGING FEEDING WATER QUALITY FOR OPTIMAL PRODUCTION

The term 'feeding water' is used to describe an untreated water source that is available to prepare nutrient solutions for soil-less crop production. Different factors can be used to define feeding water quality, but the chemical composition as well as the presence of potentially dangerous micro-organisms needs special attention.

Chemical composition

The concentration of ions, measured as EC, can be used as indication of the potential quality of feeding water. Water with a low EC can be used to grow any crop. High EC feeding water, usually high in sodium (Na+), magnesium (Mg2+), sulphate (SO42-) and chloride (Cl-) can only be used to grow saline-tolerant crops. These include amaranths, Swiss chard, melon and cherry tomatoes.

Examples of crops that are extremely sensitive to saline conditions are Blueberries and Disas. Most of the remaining greenhouse crops vary between moderately sensitive to moderately tolerant, as can be deducted from the EC levels, associated with the nutrient solutions as recommended for different crops.

It should be kept in mind that the absorption of water is restricted at increased root zone EC levels. The water in the lake of Galilee is widely used in Israel, even though it has an EC of ±1.0 mS cm-1. The EC of water in the Vaal Dam varies between 0.3 and 0.9 mS cm-1 but the EC in the lower Vaal River may be higher in relatively dry seasons. Compared to this, the quality of Stellenbosch's water is excellent, with an EC of about 0.1 mS cm-1, as is also found in other water streams from unpolluted, high rainfall mountainous areas.

However, there is no guarantee that water with a low EC can safely be used for soil-less crop production, since micronutrients may be present at phytotoxic levels without affecting the EC.

Two examples are high zinc (Zn) levels in rainwater gathered from galvanised roof surfaces and high copper (Cu) levels where copper water pipes are used.

Macronutrients in feeding water

Water should be chemically analysed in order to determine the levels of the different nutrients in solution. In low rainfall areas, high levels of salts are usually present. Apart from Na+ and Cl-, high levels of essential nutrients such as calcium (Ca2+) magnesium (Mg2+) and sulphate (SO42-) may also be present in high-EC water.

The other essential ions are usually found at lower concentrations, depending on the area and the water source. The higher the ratio of useful ions compared to Na+ and Cl-, the better the potential of the water. These essential nutrients should be topped up to optimum levels. Since Mg2+ may be present at high concentrations in high-EC water, it may reach toxic levels when Mg fertilizers are simply added to the water at normal recipe levels. A high Mg2+ concentration in a nutrient solution may restrict the uptake of Ca2+ and K+.

Micronutrients in feeding water

Apart from high sodium, chloride or macronutrient levels in high-EC water, it may also contain high or toxic micronutrient levels. Micronutrients are usually present at such low concentrations that even at relatively high micronutrient concentrations they do not affect EC readings. Should feeding water contain micronutrients at high levels, exceeding the concentrations prescribed for different crops, the water should be avoided or handled with care. As with macronutrients, the micronutrient levels in feeding water should be considered when planning nutrient solutions and should be topped up to optimum levels.

Micronutrient phytotoxicity

Strawberries need relatively low boron (B) levels due to physiological problems with B at >0.32 mg L-1. Tomatoes can tolerate B at levels of up to 1.1 mg L-1, almost four times higher than the recommended level. It is recommend that Zn be used at 0.33 mg L-1 for substrate-grown tomatoes, but toxicity can be expected at only twice this concentration.

High Zn-levels are usually found in water gathered from galvanised roof surfaces. Copper-sulphate is a well-known chemical, used to kill algae in swimming pools. Thus, the potential phytotoxic effect of high Cu-levels is well-known. Most crops need Cu at 0.05 mg L-1. According to Steiner (1984), Cu may be phytotoxic when its concentration is doubled to 0.1 mg L-1. Copper pipes should thus be avoided in hydroponic units.

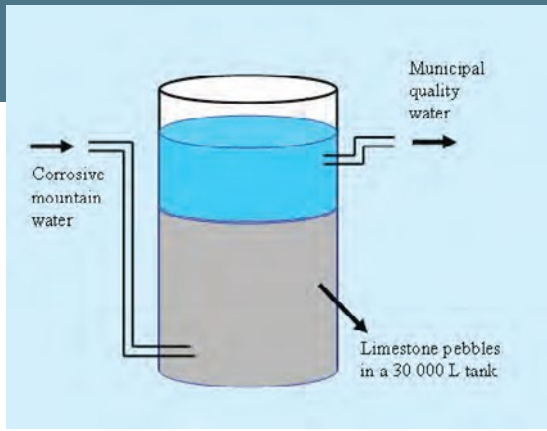

Figure 1. Treating acidic- or zero-alkalinity feeding water with limestone pebbles.

Manganese toxicity problems may develop on lettuce (open or loose tulip-shaped heads) where seedlings are raised on sphagnum peat, due to high levels of Mn in this European substrate. High iron (Fe) and manganese (Mn) levels in some feeding water sources may block irrigation drippers. These water sources should be treated to lower Fe and Mn levels.

Total alkalinity (pH)

The pH of water and nutrient solutions can be manipulated by adjusting the total alkalinity. Total alkalinity is the aggregate concentration of carbonate, bicarbonate and hydroxide. The total of these ions (CO32- & HCO3- & OH-) in water is determined with a titration, by adding acid to the sample until the pH reaches a level of 4.5. Some water-soluble fertilizers may be slightly acidic. Thus, the total alkalinity of the water should not be too small to prevent the pH from dropping when these fertilizers are dissolved.

In mountainous, high rainfall areas, low-EC water may be acidic with a total alkalinity of zero. In order to remove the corrosiveness of such a feeding water, a huge reservoir can be filled with limestone pebbles (Aquastab) to let the water pass through it (Figure 1).

More on this subject is available in 'Nutrient solutions and Greenhouse Management' directly available from the author, Dr. Nic Combrink: Mobile: 082 6038264 or e-mail: njjc@sun.ac.za

Stephanie van der Walt, the new country manager for IFPA Southern Africa.

NEW COUNTRY MANAGER APPOINTED FOR IFPA SOUTHERN AFRICA

The International Fresh Produce Association (IFPA) has appointed Stephanie van der Walt as the new country manager for IFPA Southern Africa. IFPA is the result of combining two produce industry organisations, namely the Produce Marketing Association (PMA), founded in 1949 and the United Fresh Produce Association (UFPA), founded in 1904.

In her new role, Van der Walt will focus on supporting IFPA's global impact through service to members, seeking opportunities to create greater value for Southern African members and providing insights into the needs of the Southern African market. As part of IFPA's global country manager team, Van der Walt will collaborate with international colleagues to create opportunities to connect IFPA's global markets.

She will also serve as IFPA's primary liaison with members, government agencies and other stakeholders in Southern Africa, as well as the IFPA Southern Africa Country Council.

Her international trade and investment law background, with over a decade of experience in the agricultural sector, will be invaluable in her new role and aligns well with IFPA's objectives.

"The benefit offered by industry associations lies in their unifying power and ability to generate critical mass, opening opportunities that would be inaccessible to individual actors," she says.

Van der Walt has worked in both the public and private spheres and has collaborated with international partners across the African continent and Global South.

Most recently, Van der Walt headed the Centre of Excellence: Land Affairs at Agri South Africa (Agri SA), granting insight into the local and international policy landscape. Prior to that, she was General Manager:

Fruit Industry at the Agricultural Business Chamber (Agbiz), working on empowering fresh fruit producers to maintain and expand export market opportunities with a focus on Asia.

If you are interested in becoming a member of IFPA or would like to get in touch with Van der Walt, please e-mail her at svanderwalt@freshproduce.com

▶ AGRIVOLTAIC FARMING FROM P 14

Elsewhere, agrivoltaic systems in East Africa are allowing farmers to make better use of land that was previously seen as unviable. An Agrivoltaic farming project in Kenya is using solar panels held several metres off the ground, with gaps in between them. The shade from the panels protects vegetables from heat stress and water loss. This has resulted in rural farmers being able to grow a greater range of higher-value crops. The project effectively harvests the power of the sun twice, the researchers say.

If solar panels can be added to greenhouses, the results could be especially transformative. Greenhouse-based farming reportedly produces 10 times more food than growing in an open field, but it can require 10 times as much power.

A pilot project is also under way in France, with more than 5,000 solar panels being placed over a farm in the north-eastern town of Amance. The panels are expected to be connected to the grid in December, and they could produce 2.5 megawatts of power at peak times, Euronews reports.

Future

Agrivoltaics is said to play an important part of the future of agriculture and our resources will be more sustainable through its implementation. While taking shape in countries such as China and Europe, it is still in its infancy in South Africa. It might be a new term for many farmers, but it is an exciting new technology and opportunity with impressive results that will make a significant impact on the farming sector.

Sources: M Hallett (Herholdts), S Hall (WEF)

The ideal way of growing strawberries: In shade net houses away from most pests and diseases under controlled conditions and a watchful eye. (Pic Cape Town magazine)

DETECTING STRAWBERRY LEAF DISEASES AND HOW TO COMBAT IT

Fungal diseases of the strawberry leaf may occur as soon as the first leaves unfold in early spring and continue until dormancy in late autumn. On highly susceptible varieties, these diseases can cause significant economic damage. The primary damage from leaf diseases is a loss of vigour through reduced leaf area. If outbreaks of these leaf diseases become significant, the plants will become weakened resulting in increased susceptibility to root diseases and winter injury.

The three major leaf diseases that are caused by fungi have a similar disease cycle and are controlled in a similar manner. Leaf spot, leaf scorch and leaf blight is the most common leaf diseases and they all overwinter in infected dead or living leaves. They all produce spores that spread the disease by causing new infections during moist, warm conditions.

Leaf Spot

Leaf spot is caused by the fungus, Mycosphaerella fragariae. Symptoms of leaf spot first appear as circular, deep purple spots on the upper leaf surface. These spots enlarge and the centres turn greyish to white on older leaves and light brown on young leaves. A definite reddish purple to rusty brown border surrounds the spots. On fruit, superficial black spots may form under moist weather conditions. The spots form on ripe berries around groups of seeds. The spots are about 6mm in diameter, and there are usually only one or two spots per fruit. However, some fruits may be more severely infected.

The fungus overwinters as spores in lesions on leaves. The fungus infects the plant and produces more spores in spots on the upper and lower leaf surface that spread the disease during early summer. These spores are spread by splashing rain. Middle-aged leaves are most susceptible. Lesions also develop on stems, petioles and runners.

Leaf Scorch

Leaf scorch is caused by the fungus Diplocarpon earliana. Symptoms of leaf scorch consist of numerous small, irregular, purplish spots or "blotches" that develop on the upper surface of leaves. The centres of the blotches become brownish. Blotches may coalesce until they nearly cover the leaflet, which then appears purplish to reddish to brown.

The fungus overwinters on infected leaves. The fungus produces spore forming structures in the spring on both surfaces of dead leaves. These structures produce spores abundantly in midsummer. In the presence of free water, these spores can germinate and infect the plant within 24 hours. Older and middle-aged leaves are infected more easily than young ones.

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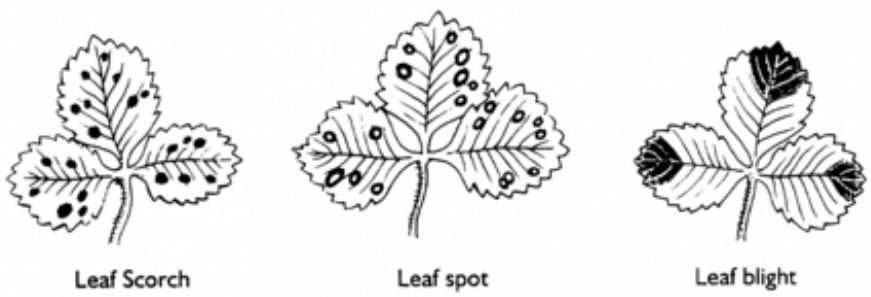

Figure 1. Typical symptoms of leaf scorch, spot, and blight on strawberry leaves.

▶ DETECTING STRAWBERRY...

Leaf Blight
Leaf blight is caused by the fungus, Phomopsis obscurans. Symptoms of leaf blight infections begin as one to several circular reddish-purple spots on a leaflet. Spots enlarge to V-shaped lesions with a light brown inner zone and dark brown outer zone. Lesions follow major veins progressing inward. The whole leaflet may turn brown. In severe cases, stolons, fruit trusses and petioles may become infected which may girdle and kill the stem.

The fungus overwinters as mycelium or fruiting structures on the old leaves that remain attached to the plant. Spores are spread by rain splash early in the spring. Leaf blight is most destructive to older leaves in the late summer. Petioles, calyxes and fruit may also be infected earlier in the season.

Control through resistance
Leaf spot and leaf scorch are controlled most effectively by the use of resistant varieties. Your seeding grower should be able to provide you with the latest resistant strawberry varieties. These cultural practices should help reduce infection: Remove the older and infected leaves from runner plants before setting. Take care in spacing runner plants in matted-row culture. Plant in light, well-

Figure 2. Strawberry leaf spot.

drained soil in a location exposed to all-day sun and good air circulation.

Control weeds in the planting area. Weeds reduce air circulation and increase drying time for leaves. (Leaves stay wet longer in weedy plantings). Removing infected leaves after harvest (during renovation) is helpful in reducing inoculum and controlling all the leaf diseases.

If leaf diseases are a problem in the planting, fungicides will aid in control. However, the emphasis on control of leaf

Figure 3. Strawberry leaf scorch.

Figure 4. Strawberry leaf blight.

diseases should be placed on the use of resistant varieties.

Source: M Ellis, Plant Pathologist.

Training up tomatoes and managing each plant for top performance is a continuous process.

TRAINING AND PRUNING GREENHOUSE TOMATOES FOR HIGHER PRODUCTION

Some growers still ask, "Why train and prune greenhouse tomatoes?"

The main reason for this procedure, i.e. removing excess shoots, leaves, flowers, and fruits maximizes ease of harvest and fruit quality. Obviously this system is only for indeterminate, non-"bush" type tomato varieties.

Training
Stretch a strong wire cable over each row of tomatoes at a height of about 2.5 meters. Hang enough string (polypropylene or hemp, 6 ply) above

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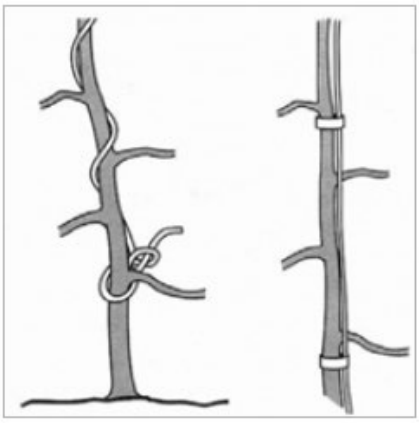

Figure 1. Securing string to tomato stem

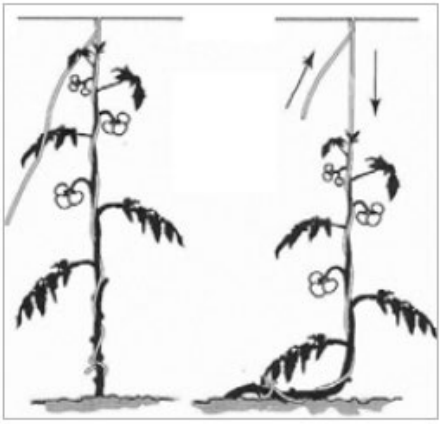

Figure 2. Tomato plant at left will be lowered to position on right by releasing some string from support wire

Fig 3. Pinching-off side shoots

each plant to reach the base of the stem and tie or lip the string to the main stem (Fig. 1).

As the tomato plant grows, wrap or clip the string around the plant. Lean and drop each tomato plant in one direction when it reaches the cable by releasing some string from the wire (Fig. 2).

Pruning

Side shoots: Prune tomato plants to a single stem by off any side shoots (Fig. 3). Do not use a knife. Do this at least once per week; remove side shoots when they are very small. Do not remove side shoots above the newest flower cluster.

Leaves: Remove the two to three leaves under fruit clusters that begin to yellow, and wilt and the fruit matures. Make sure the fruit is at the mature green stage (Fig. 4) before removing leaves.

Figure 4. Mature green stage

Flowers and Fruits (optional): Prune flower clusters and fruits to help achieve larger tomatoes. Prune remaining flowers in clusters once there are three to four well-formed fruit on that cluster. Remove any abnormal flowers and deformed fruits to reduce competition between growing fruit.

Growing points (optional): For fall crops, remove the growing point of the main stem about 45 days before harvesting the last fruits. Leave two to three leaves above the top cluster to shade and feed the top fruits. For summer crops, do not remove the growing point of the main stem. Instead stop pollination or remove flower clusters about 45 days before harvesting the last fruits.

By: Gary Pearson

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