ucf Undercover farming

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SCRIPTURE FOR ENCOURAGEMENT

John 14:1 NIV

Do not let your hearts be troubled. Trust in God; trust also in me (Jesus). In my Father's house are many rooms; if it were not so I would have told you.

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The greenhouse industry experiences stress currently, and it is mostly about increased input costs such as high fertilizer, electricity and coal prices. We just battled through a bad Covid period – which, by the way is still globally criticized as being a fallacy brought about by certain self-enriching individuals or companies. Nevertheless, when you read examples of how people pulled through and survived the pandemic times, one once more realize what characteristics lies in a farmer.

Dirk de Bruin of Maluvha (read his story in this edition) is only one such example. It is sad to learn when greenhouse farmers fall by the wayside and the only conclusion is one of poor judgment and possibly forward planning management. The astounding technologies available today make greenhouse production so much easier.

My personal opinion is that one should not be put off by the cost of implementing new technologies, but rather put together a financial plan on how much your capacity will increase if you scale up and how soon the cost incurred will be recovered. As simple as that.

Even things like load shedding that takes its toll on all of us, is not insurmountable; we have access to solarization and different other means to 'green' our farms. Let us wake up to the days we are living in and apply technologies of the day to carry on production! Glorious season to all.

Professors Nick Kotze and Eugene Cloete receive a tomato plant from Mr Guido Landheer from the Dutch Agriculture Ministry at the laying of the cornerstone of a new Horti Demo Centre (photo supplied)

HORTICULTURE DEMONSTRATION GREENHOUSE AT SU PLANTS RZ SEED

RIJK ZWAAN
Sharing a healthy future

Rijk Zwaan, the popular supplier of seed to greenhouse growers once more proved its affinity for training a new generation of greenhouse growers for the future. This comes along with the Horti Demo Centre on the grounds of the University of Stellenbosch that was officially established on 11 May 2022. A symbolic handing over was staged with a tomato plant and cutting of a ribbon by Mr Guido Landheer, director-general at the Dutch Ministry of Agriculture, alongside Prof Nick Kotze (Head of Horticulture Faculty at US) and Prof Eugene Cloete of the University of Stellenbosch.

The components for an almost 3,000m2 large and six metre-high greenhouse arrived in South Africa and construction is now completed with the first Rijk Zwaan tomato plants planted. These are grafted tomato seedlings of the following types: Florantino RZ F1, Solarino RZ F1, Rasbora RZ F1, Blenny RZ F1, Cypry RZ F1, Chromis RZ F1 and Gourami RZ F1.

Companies involved with Rijk Zwaan on the project

Six Dutch companies (Delphy, Koppert, Rijk Zwaan, De Ridder, ControlUnion, Svensson), a South African company (Greener Solutions) and Stellenbosch University received 900,000 Euros (R16m) to build a fully equipped greenhouse with what's best and most cutting-edge in Dutch horticultural technology currently. Half of the cost is provided by the Dutch government and the other half by the consortium.

According to Prof Nick Kotze, Head of Plant Health in the department of Agronomy at the University of Stellenbosch, the Horti Demo Centre is a major progressive step of the university's current horticultural facilities for greenhouse management and vegetable production.

Recycling

The Horti Demo Centre follows the principles of circularity: re-circulation of water (it runs predominantly on rain water) and nutrients within the system, resulting in a 30% saving in both commodities and moreover, eliminates the risk of environmental contamination.

Inside, pest pressure and the concomitant use of chemical pesticides is dramatically reduced by the insect netting at all openings.

"For students, both undergraduate

Cypry RZ F1

Florantino RZ F1

but especially for postgraduate students, to rub shoulders with international technology places them in another league. I always tell my students: future industry experts have to come from among us, and you can't really become an expert if you don't have access to relevant first world technology," Prof Kotze says.

Higher Fresh Produce Production

While he's very excited about the impact it will have on the quality of their teaching, the project is intended to go beyond the campus to become a locality for farmer training taking place inside the fully automated, wholly climate-controlled greenhouse. "I'm certain we could easily double production," Prof Kotze said.

Rijk Zwaan commended the Centre as they especially intend to introduce new or small-scale farmers the very best

CONTINUED ON PAGE 7 ▶

RIJK ZWAAN

Sharing a healthy future

FIND YOUR VARIETY

Rijk Zwaan offers a wide range of high-quality vegetable varieties. We select and test them thoroughly to ensure their suitability for growing in South African conditions. In addition to the seeds themselves, we also provide reliable information about the performance of our varieties and expert cultivation advice from our crop specialists. This ensures the grower has the best start to a successful harvest.

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Outeniqua High School Aquaponics system with leafy salads in foreground

OUTENIQUA HIGH SCHOOL IN GEORGE ESTABLISHES AQUAPONICS TRAINING UNIT

The establishment of a greenhouse Aquaponics facility at High School Outeniqua, George offers an exciting opportunity for learners to obtain practical experience in co-operative and project based learning, research, entrepreneurship and community involvement. "Aquaponics provide thus the potential to serve as a live, active learning and tutorial aid," according to the Headmaster, Mr Christo Vorster.

On 9 August 2021 a terrain inspection and project site design was executed. By 18 September 2021 the project was officially assigned to Outeniqua High School. Private financial aid and partnerships as well as financial support from individuals and businesses made the project financially possible. Installation and initial training was done by La Pieus Aqua under leadership of Mr. Danie Reinecke. The unit is managed by Mr Riaan E. Truter.

Fish used to enrich the water from the Aquaponics system to the hydroponics systems' plants are Tilapia (Oreochromis mossambicus) which are kept in four 10 000 liter dams in the greenhouse. Currently municipal electricity is used, but with the several interruptions in supply, causes a nerve wrecking negative influence on both fish and plants. This causes the system to be under even more pressure during summer when oxygen (O2) levels drop and cause further stress on fish and plants.

Plants are under heat stress because of non-circulating water and therefore cannot bear the quantity and quality of fruit it should. Without a doubt, a solar system will be the next step to ensure durability and even functioning of the whole Aquaponics system. This obviously depends on the financial viability with respect to the amount of learners who prove to be totally committed future greenhouse producers or technicians and wish to follow this as a career.

Climate control is of much importance in managing a greenhouse productively. Therefore early planning for ventilation was introduced to optimize production.

Danie Reinecke of La Peus Aqua Holdings who constructed and installed the Aquaponics system remains involved through technical service and information to see the system go forward effectively. A combination of grow bags containing vermiculite as grow media and a NFT system (horizontal, raised system) is in place.

The system is fed with Agri-Boost and iron once per week which is dissolved into the system to feed the plants. The water return to the fish is shut off for two days. Therefore; during two days of the week the system is run purely hydroponically to protect the fish.

The Outeniqua High School Aquaponics unit currently plants Leafy salads, Cucumber, Tomatoes, Basil, Kale and at a small scale, Eggplant in order to determine which produce are most viable to grow in the greenhouse. Seedlings

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are acquired through Rijk Zwaan, an internationally acclaimed seed supplier.

The facility provides for two Agricultural Science classes, a research laboratory, packing facility for greenhouse produce and a shop to be used as local marketing outlet of fresh produce.Learners will be offered ten subjects in Aquaponics and greenhouse management. These are: Life Science, Agricultural Science, Consumer Study, Geography, RTT, Information Technology, Hospitality Studies, Design, Accounting and Physical Science. All school tasks are focused on research and real world situations.

The system management currently supplies to different specialty shops, the Boys hostel and has also supplied a Spar shop. The Aquaponic Deli will also market fresh produce.

RZ Cucumbers in the greenhouse.

According to the Headmaster, this project is central to the school's assessment program. It offers a wide range of opportunities for development of learner's entrepreneurial insight and skills.

There are already several investors, donors, knowledge and learning partners as well as governmental departments on board and others which intend to become involved in this exciting initiative. This project is in line with President Ramaphosa's call on schools to do research on the viability to introduce Aquaponics into their curriculum in order to answer to the increasing need for practical skills development to insure food security.

Prospective partners are kindly requested to become part of this initiative which also intends to widen its scope of food production skills towards a broader community in order to assist in decreasing the high levels of unemployment, poverty and skills shortages. Interested partners may approach the school for advertising space at the greenhouse, make donations (which can be deducted from tax), sponsoring of the signage of the Deli (a business name on the shop and or produce) and sponsorship exclusivity.

"We are excited about the future of the Outeniqua High School's Aquaponics Greenhouse and Learnership entity which increases the learner possibilities and sincerely hope this model will also be rolled out by other similar-minded schools in the country," Mr Vorster concluded.

RZ Brinjal grown in the aquaponics system

Die Outeniqua Hoërskool se Akwaponiese Kweekhuis projek is daarop gemik om leerders verskeie vakke in hierdie voedselproduksiestelsel te bied. Sodoende kan hulle hulself bemagtig om nie net 'n loopbaan daarvan te maak nie maar grootliks by te dra tot die vermindering in werktekorte deur nuwe tegnici op te lei, voedseltekorte hok te slaan en toonaangewende voedselprodusente te word.

HORTICULTURE FROM PAGE 4 ▶

Chromis RZF I

production techniques that are currently available in the world. "I'm convinced we could easily double the average production of small-scale farmers. We have set ourselves the target of doubling their production and I think we can achieve that."

Having noticed the technology within the greenhouse perform under South African conditions, where the focus is much more on cooling down than on heating up as it would be in a Dutch greenhouse, will be an immense learning opportunity for the members of the consortium too, Kotze adds.

Potential for independent trials

The commercial vegetable sector of South Africa, that is traditionally a fairly fragmented sector, can also expect to see the benefit through, for example, independent vegetable trials that generate local and non-partisan data on vegetable varieties on behalf of commercial seed companies and administered by the University of Stellenbosch.

"We can add great value to the local vegetable industry," Prof Kotze explained, "and we will be able to guarantee the independence of our trials."

In conclusion, Professor Kotze said a close working relationship between academia and the commercial sector such as Rijk Zwaan, creates a platform for postgraduate students to address the research needs of the industry and provides useful contact between students and their future employers.

Rijk Zwaan, one of the major international Seed suppliers with offices in South Africa and elsewhere in Africa, offered their full support to the Centre and wishes the team much success in their endeavours. **JS**

Carnations lovingly bunched and prepared for the market.

Buckets with beautiful carnations made ready for Multiflora.

All carnation plants are treated biologically to reduce pest damage.

CARNATION GROWER OF REPUTE – GOING GREEN

Maluvha Carnation Nursery produces 7 million carnation stems annually. Most of this produce is delivered to Multiflora Flower Market in City Deep, Johannesburg. Dirk De Bruin is the CEO of Maluvha, situated in the Olifantsfontein area, and Undercover Farming recently visited this enormous carnation production farm.

In 1980 Dirk decided to make a change in his career as an architect and joined his former father-in- law, Geoff Botha on his flower farm. In 1994, this mutual agreement came to an end and Dirk ventured out on his own with thorough knowledge of flower production. A friend of longstanding, also an architect who became a flower farmer, Marcus Henkel, invited Dirk to purchase land next to his farm at Olifantsfontein.

Maluvha produces carnations in greenhouses spanning six hectares on a 30ha farm. Maluvha is run by Dirk as CEO/Managing Director, his wife Loma who runs the Office Administration and Human Resources and her son Migael (an attorney by profession, but now also a keen cut flower producer), who is in charge of the day-to-day management of the flower farm.

Migael, who completed a course with AVCASA soon after starting at Maluvha, has since built a strong relationship with Real IPM, the leading biological control company in South Africa.

Dirk praises Real IPM for making a major difference to his business and instituted modes of biological control on nearly all pests with Real IPM's biological products.

Red Spin Mite remains a problem and is highly active in the summer heat especially on older plants. It is also sometimes prevalent in winter during warm climate control in the greenhouses. Thrips sometimes surfaces causing discoloration of flowers. Yellow tackey-surface tags are hung above lanes in the greenhouses to check the severity of Thrips attack and thereby managed. Moths also at times cause problems but is managed by hanging basket-shaped catchers containing pheromones which draw moths in.

Bat stations for bats to control moths and owl houses for owls to control rodents have been installed at various sites across the farm and should be inhabited soon.

The flowers bunched and packed for the market is carefully selected to be pest free and of outstanding quality.

Carnation production offers major challenges but can be fruitful if it is well managed. Fusarium oxysporum levels in the soil is a problem that requires serious attention and steam sterilization to sterilize soil in preparation for planting. The constantly rising input costs of diesel, coal, fertilizer and the

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Dirk de Bruin CEO of Maluvha with sheep grazing on carnation stems. At his back part of the six hectares of greenhouses are visible.

poor power supply, to name but a few, is a further challenge to keep up production levels.

Dirk explained that the rests of the flower stems in the flower pack shed are fed to the small herd of "free range sheep" on the farm that are kept keeping the grass short around the greenhouses to limit insect pests nesting in long grass. Dirk told us that the sheep find the carnation rests a delicacy, whilst in the meantime their intestines turn the cuttings into much needed nitrogen and potassium. This is again used to fertilize the new flower beds.

Electricity breakdowns these days are not only a headache to city dwellers but also to any greenhouse operator. During extreme hot or cold weather, climate control needs to be implemented to keep produce growing evenly. At Maluvha, 50% of the operation is off the grid and Dirk aspires to install more solar systems to ensure continuous power supply. The boilers, used for heating at night during winter, breaks down because of the on-off power supply. A further impacting factor is the increase in the coal price. Dirk therefore has started implementing an extensive plan to free the operation from outside service delivery breakdowns that will ensure an even flow in production.

Covid also took its toll on the farm as workers were not able to enter the farm to tend to the greenhouses resulting in production and maintenance being severely harmed – so much so that Maluvha is still not back on track with its harvesting schedule.

"We are currently growing more than 30 varieties of carnation flowers, which is mostly sold through Multiflora and Flora Direct in Johannesburg. From here it is being distributed by air and road to clients throughout South Africa and foreign countries. The carnation mother plants for Maluvha are purchased from companies in Spain and Colombia." Dirk explained that Maluvha makes their own seedlings, requiring labour intensive processes and cold storage rooms.

Flowers are cut, packed and tied with elastic bands, then sleeved and packed into buckets, which in turn goes onto trolleys. In the past, each trolley carried a handwritten itemized delivery note. Recently Maluvha started using the very efficient EDN (electronic delivery note) system, developed by Multiflora. Delivery notes are created at the point of delivery before going to the Multiflora auction floor or Flora Direct deliveries.

Dirk is most impressed with this new EDN system, which offers a faster and more accurate flow of administration and payments. At the flower auction, buyers are informed about the look, quantity and origin of the flowers available. "When I think of what tremendous advantages the EDN system brought us, I would strongly advise other flower growers to make use of this fantastic system," Dirk said. He reiterated that, from day one in 1995, when he sent the first flowers to Multiflora, he was successful in his sales and is most satisfied with their service not only to his business, but also the South African flower industry at large.

Maluvha greenhouse workers pick flowers daily from Monday to Friday. The flowers are immediately sorted, packed and kept in cold storage rooms until early the next morning when it is delivered in time for the auctions at Multiflora. Maluvha prides itself and its eighty workers in being able to cut, pack and supply between 20 000 and 40 000 carnation daily from the six hectares farm for five days a week, without fail.

During Covid, Maluvha incurred heavy financial setbacks and the huge effort that is being made to counter these losses will still quite some time. Therefore, Dirk does not envisage new additions to the farm soon. He is rather investing in the upkeep and replacement of greenhouse roofs, irrigation systems and more intensive farming methods striving towards greener farming practices on his current cut flower production.

Maluvha produces 80% of Carnations on the Multiflora market and they are the major carnation grower in South Africa. During the past 40 years Dirk has also built strong ties with the flower market and the South African flower growers in general. According to him, roses are currently in the highest in demand, followed by chrysanthemums, with carnations and gerberas' taking third place.

Most roses are imported and the myth that carnations are short-lived is knocked out of the window by Maluvha carnations having a vase life of at least two weeks due to the flowers that are specially treated against ethylene after being cut. During the eighties, carnations were by popularity the number one cut flower, followed by roses, but this changed because of consumer demand and producer economics.

Dirk explained that South Africa is the smallest supplier in the world of carnations, but the fact that carnations are grown in Colombia and further from markets, it still maintains its beauty and strength far longer in homes all over the world.

Maluvha is indeed a carnation producer of repute, striving towards greening its future and maintaining their promise to deliver cut flowers carnations to their customers that are truly "a cut above the best"! **JS**

A new study has found that crops can grow in greenhouses with built-in transparent solar cells. Pixinooo/Depositphotos

COULD TRANSPARENT SOLAR PANELS BE THE ANSWER FOR SA GREENHOUSES?

By means of introduction, a transparent solar panel converts sunlight into electricity using photovoltaic (PV) glass. This process generates clean, renewable energy and does not contribute to the emission of greenhouse gases.

Transparent solar power panels can easily be installed in workplaces and houses, allowing the technology to transform almost every structure on the planet into a solar generator.

How Solar Panels Work

Solar cells embedded in a panel must absorb solar radiation to generate energy. Transparent solar panels only absorb a portion of the sunlight invisible to the naked eye while allowing the normal visible light to pass through. Solar concentrators are installed to absorb specific invisible ultraviolet (UV) and infrared (IR) wavelengths and then convert them into a new wavelength. This new wavelength is then steered to PV cells, where it is converted into electricity.

Transparent Solar Panels in Greenhouses

Due to the growing population and extreme weather, future farmers may be forced to rely on greenhouses to increase crop production. Greenhouses increase food production per acre by up to 100% compared to open-field farming. However, they demand enormous amounts of electricity to maintain their temperature.

Solar energy is one way to generate cost-effective electricity for a greenhouse. However, solar panels are logically placed on the roofs of buildings for maximum energy production. But for a greenhouse, the roof is a strategically important place. It has to provide sufficient bandwidth for the passage of sunlight for the growth of plants and the accumulation of a suitable temperature.

On the other hand, transparent solar panels allow passage of most of the light that plants need, absorbing only a small part, which is converted into electricity. They are also an effective insulator, helping to maintain a constant temperature in the greenhouse.

Scientists believe that transparent photovoltaic cells will have little effect on plant growth, making them ideal for use in greenhouses. They also present an opportunity to diversify technologies for producing sustainable energy.

Greenhouses can become energy-neutral, producing energy equal to energy costs by blocking a limited amount of sunlight. However, if farmers want to generate more energy, they

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can further reduce the amount of light transmitted.

Transparent solar panels limit the use of primary energy sources (petroleum, natural gas) for heating and cooling the greenhouse, reducing greenhouses' energy footprint. As the energy supply is renewable, it produces carbon-free electricity without affecting crop productivity.

Recent Developments
Researchers at North Carolina State University (NCSU) installed semi-transparent solar panels in greenhouses. They discovered that it could generate electricity without harming the health or growth of the plants. They conducted a series of tests on various red leaf lettuces under various glass types and light wavelengths to see if the transparent solar cells harmed the plants.

The results revealed that the lettuce produced with transparent solar cells did not differ significantly in any critical measurement, such as size, weight, antioxidants, or CO2 absorption. The solar panels also assisted with temperature control in the greenhouse.

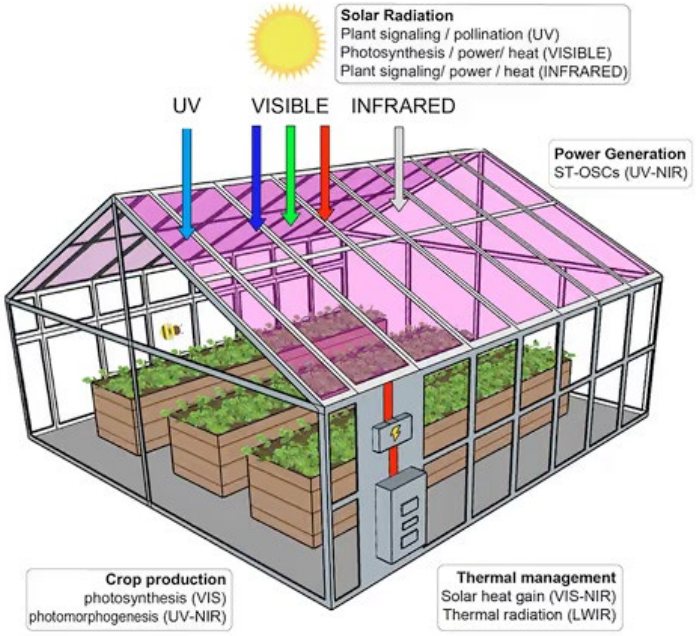
INDUSTRIAL AVAILABILITY

PanePower Solar Window
A solar energy company in Greece has developed the PanePower Solar Window (SW). PanePowerSW is a unique transparent (up to 70%) glass for solar panels that generate clean energy using photovoltaic technology. More importantly, it allows light to shine through the windows of greenhouses and commercial buildings.

PanePowerSW contributes to energy savings in buildings of up to 30% and allows greenhouses to grow crops while reducing energy costs, which are estimated at 25% of total operating costs.

Solar Module
A Swiss company has developed a next-generation PV panel based on the Translucency & High Efficiency in Agrivoltaics (THEIA) solar module. The company claims that this photovoltaic module has an efficiency of up to 20%, making it the most efficient on the market.

The module uses hexagonal lenses,



How transparent solar panels work. (NCU)

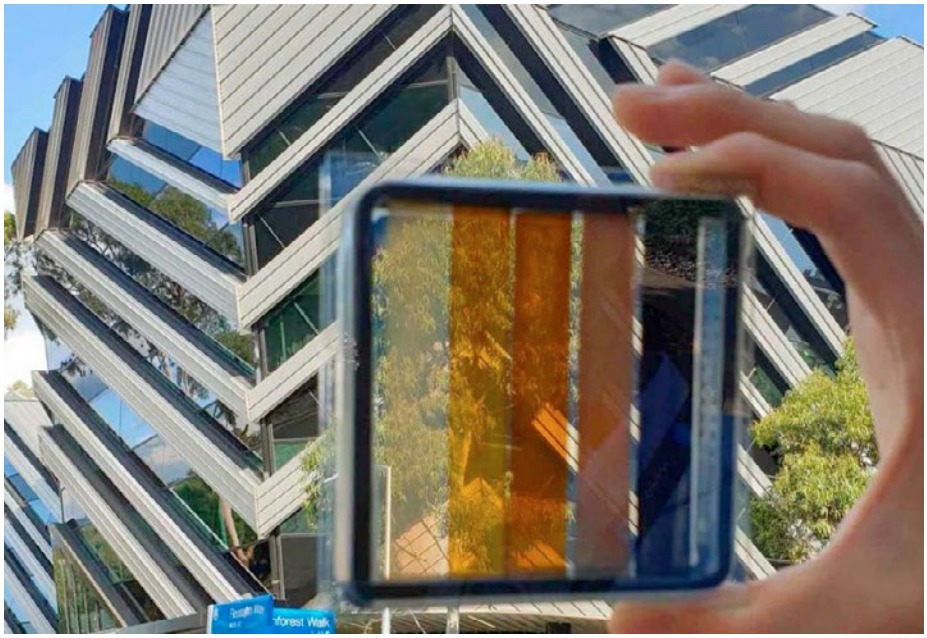
which converge sunlight into a single beam. The transparent panels feature two modes: E-Mode, which generates electricity while transmitting diffuse light, and MLT-Mode, which is 78% transparent but does not generate electricity.

The Future of Transparent Solar Panels
The efficiency of fully transparent solar panels is under 1%, although the technology has the potential to reach 10%. In contrast, conventional solar panels can achieve an efficiency of up to 22% or more.

Transparent solar panels are not yet powerful enough, however, this will inevitably change in the near future. In comparison, nearly a decade ago, solar energy was not considered competitive, and now it is considered one of the cheapest ways to generate electricity.

Transparent solar panels are a promising invention that will allow the widespread use of solar energy for electric power generation. Unlike ordinary panels, they do not clutter up space and do not create unnecessary shadows.

Future greenhouses can be made energy-neutral and self-sufficient solar power plants by installing transparent solar panels capable of using energy from light not used for photosynthesis.
Source: Review by Laura Thomson



Red spider mite (Pic: Grow Veg)

Red Spider mite cobwebs on tomato leaves. (Pic: Garden Design)

MANAGING RED SPIDER MITES IN A GREENHOUSE

Several types of mites can cause serious damage to a variety of greenhouse crops. Among the most common mite species are the broad mite (Polyphagotarsoeneumus latus), carmine spider mite (Tetranychus cinnabarinus), cyclamen mite (Phytonemus pallidus), the Lewis spider mite (Eotetranychus lewisi), and especially the two-spotted spider mite (Tetranychus urticae).

There are many reasons why mites are problems in greenhouses. Mites are relatively small and they spend most of their time on the undersides of leaves, within tender buds, or deep within flowers, which makes them difficult to detect and effectively control. Mites typically have a rapid life cycle (i.e., populations build rapidly), they have a wide host plant range (they can be found on most plant material), and are usually resistant to pesticides.

All of these factors may contribute to their deserved status as a severe pest of greenhouses. In general, the biology of mites is similar. However understanding the biology of individual species is crucial for attaining effective control.

Plants Attacked and Damaged

Most mite species have a wide host range, attacking a variety of greenhouse crops. They feed on flower plant materials such as African violets, begonias, chrysanthemums, cyclamens, dahlias, fuchsias, gerberas, geraniums, gloxinias, hibiscuses, ivies, jasmines, impatiens, New Guinea impatiens, lantanas, marigolds, petunias, snapdragons, verbenas and zinnias.

Mites feed on plant material by piercing plant tissue with their mouthparts and removing plant fluids. Some mite species inject a toxin in their saliva as they feed. Feeding damage varies depending upon the specific mite and plant species being attacked, but often appears on the upper leaf surface as a characteristic mottling or speckling.

Life Cycle and Biology

High temperatures of 21-27° C and lower humidity favour the development of broad mites. Female broad mites lay between 30-75 eggs on leaf surfaces over an eight to 13 day period. Larvae (nymphs) hatch in two to three days and begin feeding. Broad mites can complete their life cycle (egg to adult) in as little as seven days.

High relative humidity (80-90%) and temperatures of 16°C favour the development of cyclamen mites. Severe outbreaks of cyclamen and two spotted spider mites typically occur in greenhouses in the fall and winter months. Adult female cyclamen mites may live for up to one month and can reproduce without mating. Each female lays two to three eggs per day for up to two to three weeks.

The eggs are laid in moist, dark places in crevices and at the base of the plant. Most eggs will develop into females. Nymphs hatch from eggs in three to seven days, and feed for four to seven days. Larvae then pupate (transform) and adults emerge in two to seven days. Thus, the cyclamen mite life cycle varies from one to three weeks depending upon greenhouse temperatures.

Spider mite species such as the two-spotted, carmine, and Lewis mite favour hot and dry conditions. Each female can produce 100-200 eggs which hatch into larvae in three to five days. Spider mites remain in the larval stage for a brief period (four to seven days) before transforming into adults. The typical life cycle (egg to adult) takes seven to 14 days, but varies considerably depending on temperature. All developmental stages occur on the plant. Large numbers of mites produce visible webbing, which can completely cover leaves and flowers.

Control

Spider mites can be controlled on greenhouse crops chemically or biologically. A number of conventional pesticides (miticides) are labelled for mites. Conventional pesticides that usually provide good to excellent control include Abamectin, Bifenazate, and Pyridaben. However, high volume and repeat applications may be necessary to achieve adequate control.

Biological Control

One of the best preventative methods for managing spider mite control is using and encouraging the presence of natural enemies. Most of the predators that feed upon plant-damaging mites are beneficial mites. They can be purchased from online sources, and are becoming more readily available. Not all predatory mites are created equal. Be sure to read all specifications, technical information, and ensure that the pest mites have been positively identified.

The number one predator for twospotted spider mites is the Persimilis mite (Phytoseiulus persimilis). This mite works best at temperatures between 13°C and 29°C.

However, above 29°C, they cannot keep up with the two-spotted spider mite populations. They are best released in the spring and fall. In the garden they can be applied at rate of 1 mite per square foot, but individual plants can also be treated.

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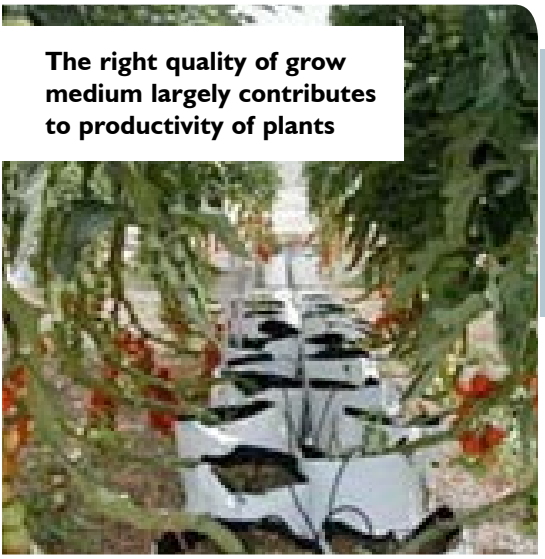

The right quality of grow medium largely contributes to productivity of plants

CHOOSING GROW MEDIA FOR A HYDROPONICS SYSTEM

In hydroponics, the growing medium takes the place of the dirt/soil. Not to provide nutrients, but so the roots can support the plants weight and hold it upright. Just about any inert material can be used as a growing media. Inert meaning that it can't/won't decay or break down quickly, thus providing nutrients to the plants.

The growing medium won't be able to grow anything on its own. If you placed plants in hydroponic growing media, and watered it with plain water, the plants would starve from nutrient deficiency. It's simply there to help support the plants weight as well as the moisture and oxygen the roots need. The nutrients the plants need, are provided by the nutrient solution, and is what the growing media is watered and moistened with.

There isn't one growing media that is better than the rest. Especially with so many different hydroponic system designs possible. However many growers eventually favour one type over others. There are a lot of things to consider when choosing what to use as a growing media. The type of system you're growing in and how you design and build that system is the biggest factor.

Drip systems
Drip systems are fairly easy to control moisture in. As long as you design it so it has good drainage, and limit water pooling at the bottom you should be able to keep your growing media from being too soggy. We like to use river rock at the bottom to aid drainage, and keep the growing media from sitting in a pool of water at the bottom.

NFT systems
NFT systems use a very shallow, but continuous stream of water at the bottom of a channel where the roots wick up moisture. Most NFT systems either use small starter cubes or small 1 inch baskets, and then let the roots just hang down into the flowing water. If these cubes or baskets are too close to the water supply, and your growing media can become saturated easily, that combination can lead to "stem rot" if the growing media around the stem is always saturated.

Ebb-Flow (flood and drain) systems
Flood and drain systems can vary quite a bit in design. But generally you would want to stay away from any growing media that floats like Perlite and Vermiculite. Each time the system cycles on for the flooding stage the growing media will become weightless, and then your plants will lose all their support and want to tip over.

Also with flood and drain systems, and depending on the type of growing media you choose, you want to make sure you have good drainage so that the growing media isn't continually saturated.

Grow rocks won't pick up much moisture, but we like using coco chips a lot because they are inexpensive, but coco chips wick up water if they are sitting in it. So a layer of river rock at the bottom keeps it from sitting in the water.

Water culture systems
Water culture systems don't generally use much if any growing media because it is designed so the plants roots are submerged into the nutrient solution itself. So plants are generally started using small starter cubes or small baskets. Starter cubes typically are suspended above the water line, while baskets can suspended either just above or just below the water line.

The growing media you choose and how much it absorbs moisture will make a difference. You don't want it to become saturated, you just want it to be moist at the bottom, and the top should be dry. The roots will grow downward into the nutrient solution.

Now you may be wondering if it's so bad if the growing media becomes saturated, why the roots won't become suffocated if they're under water all the time in a water culture system. First not all plants do well in water culture systems. Second and most important, a water culture system uses an air pump to generate a lot of air bubbles to the roots under water. The plants get oxygen from these air bubbles directly, as well as the air bubbles increase the dissolved oxygen levels in the water itself.

Rockwool
Rockwool is one of the most common growing media's used in hydroponics. Rockwool is a sterile, porous, non-degradable medium that is composed primarily of granite and/or limestone which is super-heated and melted, then spun into small threads like cotton candy. The rockwool is then formed into blocks, sheets, cubes, slabs, or flocking. Rockwool sucks up water easily so you'll want to be careful not to let it become saturated, or it could suffocate your plants roots, as well as lead to stem rot

Rockwool grow media

▶ CONTINUED ON PAGE 14

GROW MEDIA FROM PAGE 13 ►

and root rot. Rockwool should be pH balanced before use. That's done by soaking it in pH balanced water before use.

Coco Fibre

Coco Chips "Coco coir" (Coconut fibre) is from the outer husk of coconuts. What was once considered a waste product is one of the best growing mediums available. Although coco coir is an organic plant material, it breaks down and decomposes very slowly, so it won't provide any nutrients to the plants growing in it, making it perfect for hydroponics. Coco coir is also pH neutral, holds moisture very well, yet still allows for good aeration for the roots.

Coco fibre comes in two forms, coco coir (fibre), and coco chips. They're both made of coconut husks; the only difference is the particle size. The coco fibre particle size is about the same as potting soil, while the coco chips particle size is more like small wood chips.

The larger size of the coco chips allows for bigger air pockets between particles, thus allowing even better aeration for the roots. Also if you're using baskets to grow your plants in, the chips are too big to fall through the slats in the baskets. Both the fibre and chips come in compressed bricks, and once soaked in water it expands to about 6 times the original size. Coco fibre does tend to colour the water, but that diminishes over time. And you can leach out most of the colour if you soak it in warm/hot water a few times before use.

Perlite

Perlite is mainly composed of minerals that are subjected to very high heat, which then expand it like popcorn so it becomes very light weight, porous and absorbent. Perlite has a neutral pH, excellent wicking action, and is very porous. Perlite can be used by itself, or mixed with other types of growing media's. However because perlite is so light that it floats, depending on how you designed your hydroponic system, perlite by itself may not be the best choice of growing media for flood and drain systems.

Perlite is widely used in potting soils, and any nursery should carry bags of it. However perlite is sometimes also used as an additive added to cement. You may find it for a better price with the building supplies, and/or at places that sell concrete mixes and mixing supplies. When working with perlite be careful not to get any of the dust in your eyes. Rinse it off to wash out the dust, and wet it down before working with it to keep the dust from going airborne.

Vermiculite

Vermiculite is a silicate mineral that like perlite expands when exposed to very high heat. As a growing media, vermiculite is quite similar to perlite except that it has a relatively high action-exchange capacity, meaning it can hold nutrients for later use. Also like the perlite, vermiculite is very light and tends to float. There are different uses and types of vermiculite, so you'll want to be sure what you get is intended for horticulture use. The easiest way to be sure is to get it from a nursery.

Rockwool

Rockwool is an open cell material which means that the cells can absorb water and air. The open cells wick moisture throughout the material, and the roots can easily grow and expand through the open cell structure. While rockwool is usually used as starter cubes for hydroponically grown plants, they also have bags you can fill your growing containers with.

Pine shavings

Pine shavings are an inexpensive hydroponic growing media as well, and a lot of commercial growers use it. Generally for large scale hydroponic drip irrigation systems. Don't confuse pine shavings with saw dust. Saw dust will become compact and water logged easily. You'll want to make sure your pine shavings were made from kiln dried wood, and does "NOT" contain any chemical fungicides. Kiln dried to burn off all the sap in the wood that is bad for the plants. Most pine shaving products would be kiln dried to begin with.

Good source to find pine shavings are pet supply stores. It's used for things like hamster and rabbit bedding. Just make sure to read the package to be sure it doesn't have any chemical additives like fungicides or odour inhibitors. You should be fine if it states it's organic. Another good cheap source for pine shavings is at feed stores, it's also used as bedding in horse stalls and they sell it by cubic yard. If you have a choice get the largest partial size you can. The larger the air pockets between the shavings, the better aeration to your roots.

Pine shavings are a wood product, so they absorb water easily, thus can become water logged easily. So make sure you have good drainage so the shavings don't sit in water. If there is a possibility of it sitting in water, a layer of rocks at the bottom will aid drainage greatly.

Composted and aged Pine bark

Pine bark is one of the first growing media's used in hydroponics. It was generally considered a waste product, but has found uses as a ground mulch, as well as substrate for hydroponically grown crops. Pine bark is considered better than other types of tree bark because it resists decomposition better, and has less organic acids that can leach into the nutrient solution than others. Bark is generally referred to as fresh, composted, or aged.

Fresh bark uses up more nitrogen as it begins to decompose, so commercial growers generally compensate by adding extra nitrogen to the nutrient solution. During the composting process, nitrogen is added to the bark, and mixing it in while breaks down. So nitrogen issues are far less of a concern with composted pine bark.

Ageing is a similar process, but has less nitrogen added to it, so it's better than using fresh bark, but not as easy as the composted bark. Pine bark can be found at places that sell ground mulch, as well as ground mulch for playgrounds.
Source: Hydroponics media UW

Coco-perlite mixture





SOFT FRUIT OVERVIEW: IMPORT SEASON OFF TO A GOOD START

In Europe, local blueberry cultivation is almost over. "Here, in the Netherlands, we're processing the last stored Aurora and Liberty, and the last freshly-picked supply arrived from Poland early this week.

The Northern European season was generally good. May and June's stable weather ensured good settings, so the volumes were definitely there. The quality was better than last year, too," begins Maxim De Roeck of Fruitful-Berries.

Maxim De Roeck and Kevin Smedts of Fruitful-Berries visited their overseas blueberry grower.

"We think the fruit found its way better to market as well. Last year, around week 33, supply had greatly surpassed demand, and we had to sell our berries below cost. That didn't happen this year. The increased demand for local produce everywhere, certainly in the Netherlands and Belgium, could partly explain that."

SA Containers

"But, in Poland too, given the acreage increase, less-than-expected was exported, with more local sales. When that happens in one of Europe's largest blueberry-producing countries, it immediately eases tension in the supply markets. We began with Peru and Zimbabwe in week 36, and the first South African containers are also already at sea," says Maxim.

"Peru will, again, determine the market's direction. There's 25% more export volume expected than last year, bringing this year's total volume to 276,978 tons. Of this, 52% will go to the U.S. and 18% to the E.U." "That's a small two per cent switch, in favour of America, from last year. That has everything to do with the sky-high sea freight costs towards Europe," Maxim explains.

Peru & South Africa

"July was cold in Peru, so volumes have slowed slightly, while it's currently a high-demand market. Peru and South Africa usually peak around week 44/45. We expect to process 2,500 tons of overseas blueberries this season. Most of that will go to fixed retail programs, which we think is the only way to continue marketing the increasing acreage correctly. Together with our retail partners, we reach weekly agreements about things like the best packaging, promotional weeks, and variety selection."

Maxim and Dinis Grussner visiting Morocco. Left is the first Moroccan arrival in week 37.

"As for raspberries, the local crop normally continues until late October, with some even lasting until mid-November. Last summer's warm weather didn't do the plants any good, so volumes are decreasing a little faster," continues De Roeck. "Plus, retail programs are already slowly being supplemented with imported products. It's again a matter of waiting to see what the market does. Growers in the popular Spanish region of Huelva planted eight per cent fewer raspberries."

"Morocco, however, wants to expand considerably, but we're increasingly getting reports that those growers didn't all get plants. That could lead to some supply problems at the end of the year. We have a great relationship with our Moroccan grower, with whom we're building some projects in northern and southern Morocco.

Those have 280 hectares of raspberries already this year. We got the first pallets this week, and the quality looks promising. That season runs until week 19," concludes Maxim. **Source: Fruit Logistica**

RED SPIDER MITES FROM PAGE 12 ▶

During hot summer months, the Swirski mite (Amblyseius swirskii) works best on two-spotted spider mites. Swirskii works best at temperatures above 20°C.

They are very aggressive and can be applied generally at a rate of 5 to 10 mites per square foot, or put onto individual plants.

A side benefit is that they will also feed on some species of thrips, and whiteflies.

The Californicus mite (Amblyseius californicus) is another choice for twospotted spider mite. These mites work best at temperatures between 13°C and 43°C. They don't do well for large pest populations, so they are best used as a preventative measure. Typical rates for broadcast applications are 1 to 5 mites per 30cm square, and individual plants can be treated as well. For indoor or greenhouse settings, Mesoseiulus longipes can be used similarly to the Persimilis mite. These mites work better at low humidity, and can be used on indoor plants where other mites cannot. Release rates are 1 to 3 mites per leaf, and they attack similar prey as Persmilis mites. **By C Williams**

THE COMPLEXITY OF GROWING CANNABIS

The legalisation of cannabis for private and commercial use in compliance with regulations has opened up a new and significant market for South Africa as one of the countries with the perfect climate for growing superior quality cannabis and stimulating job creation. However, growing export-quality cannabis comes with a long list of stringent requirements, especially when you are growing cannabis for medicinal use.

According to Neil Sanford, New Business Development Executive at Aon South Africa, growing cannabis on a commercial scale requires substantial initial capital outlay with an investment that is sizable enough to carry a new business through an 18-month off take period, on average.

"While it is cheaper to produce on South African soil in comparison to other countries, you do need a license to grow cannabis on a commercial scale, with produce being used for medicinal purposes calling for stringent requirements under a cultivation licence from the South African Health Products Regulatory Authority," says Neil.

The cannabis playbook in South Africa

The private cultivation, possession and use of cannabis by an adult for personal use was legalised in September 2018 by the Constitutional Court of South Africa.

Updated cannabis laws are on the cards such as the Cannabis for Private Purposes Bill that is currently under consideration.

Any commercial use of cannabis must be cultivated under a South African Health Products Regulatory Authority (SAHPRA) cultivation licence.

The primary cannabis chemicals used for medicinal purposes are delta-9-tetrahydrocannabinol (THC) and cannabidiol (CBD).

"Cannabis that is grown for medicinal purposes requires a structure to be built that the plants are housed in, which is climate controlled in a sterile environment, comparable to an ICU for plants," explains Pierre du Preez, Head of Business Development and Client Transition at Aon South Africa.

"Once the environment is set up and is compliant with regulations, mother plants are secured that are barcoded for reference and quality purposes. Cloned plants are made from the mother plants, that are meticulously tested and nurtured to produce a yield with a suitable percentage of CBD oil for medicinal use."

There are many risk factors that need to be taken into account. "There are many potential pitfalls that a grower could be faced with throughout the cannabis growing process. This could take the form of a pest infestation that could compromise the crop, a fungus attacking the plants, something happening to the harvest in transit to the buyer, or even product liability or injury to people originating from the finalised product from a medicinal perspective," explains Pierre.

"The risks are far-reaching and can be financially devastating in any of these events for the cannabis grower," says Neil Sanford. "That is why it is important to speak to a specialised insurance broker and risk advisor in the field who has done their homework and can help you to make better decisions when it comes to your cannabis business."

It is important to consider aspects such as: Liabilities – aspects such as general premises, spread of fire, products, professional indemnity as well as D&O insurance.

Crop and greenhouse – To cover the growing crop from seed to bud, including the greenhouse.

Material damage – Property cover that includes electric fencing, buildings, computers and generators.

Business interruption – crop loss is a possibility, and you would need to consider a solution that will help you tide over to your next growing cycle, minimising business and profit loss.

Transit – to transport this high-value commodity, growers often make use of helicopters or cash in transit vehicles due to the risk of hijacking.

"Here the guidance and insights of a professional broker versed in the complexity of agricultural and cannabis risks will prove invaluable in striking the balance between affordability and being appropriately insured for a worst-case scenario. As the cannabis trade and market continues to grow and diversify, so too will the risks that the industry is faced with.

"A professional broker will prove invaluable in developing a suitable risk management strategy coupled with appropriate insurance tools so that South Africa's burgeoning cannabis industry and growers are better prepared and equipped to leverage their full market potential," Neil concludes.

GRAFTING TOMATOES FOR SUCCESS

Grafted plants can benefit your production in many ways, such as improving yields and increasing disease resistance. Follow these guidelines, which have been achieved through years of trial and error, and see your profits grow.

Grafting is an age-old process of connecting the vascular tissues of two distinct plants. The aim of grafting is to combine and utilize beneficial traits of both the rootstock plant and the scion plant (the top plant that yields fruit). While the grafting of woody plants and vines such as apples and grapes has been common for years, grafting of herbaceous plants such as tomatoes and melons has only recently become popular. Today, grafting of herbaceous vegetable plants is widely used in intensive greenhouse and tunnel production systems.

Cucumbers, peppers and tomatoes are the most common crop grown under protection in greenhouses and high tunnels and their production in these systems has benefited enormously from grafting.

The grafting of tomato rootstocks (which are chosen for their disease resistance, stress tolerance or root system characteristics such as vigorous vegetative growth) with tomato scions which are chosen for their desirable fruit characteristics offers many benefits to tomato growers. Grafted tomatoes typically have higher yields, produce over a longer period, have increased disease resistance and may require less pest management.

In the case of commercial growers, rootstock and scion seed are selected and sent to a propagation company who will grow the seedlings, complete the grafting process, and then send the grafted plants to the grower. Although this is an expensive process, it is ultimately much cheaper than the time, labour, space and equipment it would take to graft the plants needed for their operation on-farm.

For smaller operations, home growers or research facilities though, it can be useful to graft own plants to save money and allow for more control (such as limiting potential pests, diseases or viruses that could enter from an outside facility).

If a grower decides to graft their own tomato plants, it is critical to have a good understanding of the grafting process. It takes time and practice to become skilled at grafting. The following guide details the tomato grafting process developed over years of trial and error from researchers and students in horticulture.

To begin, the grafting process can be split into three distinct phases:
1. Pre-grafting/seedling growth
2. Grafting
3. Post-grafting/healing

PRE-GRAFT/SEEDLING GROWTH

The first step in the pre-graft/seedling growth phase is choosing the rootstock and scion cultivars. The most common rootstock cultivar used in commercial tomato production is 'Maxifort.' While some growers may choose to use one rootstock cultivar for large fruit scions and another for small fruit scions, in commercial practice 'Maxifort', or one of its many genetic successors, is used with practically all scion cultivars.

'Maxifort' is widely used because it has vigorous vegetative growth and has resistance to many common diseases. However, other rootstock varieties such as 'Estamino' or 'Beaufort' are also popular among growers. Once the cultivars are selected, the seeds should be sown into a 98-cube rockwool sheet (alternatively seeds can be sown in other soilless media cells) that has first been soaked with tap water for 10 minutes.

The rockwool sheet should then be placed in a growth chamber or a different climate-controlled room. Temperature in the chamber should be maintained at 23° C/20° C (day/night) and light should be provided at 260 μmol·m-2·s-1 for 16 hours/day leading to a daily light integral of 15 mol·m-2·d-1. Plants should be watered every two days with a complete nutrient solution at 100-ppm nitrogen, until the grafting date which is about 20 days after sowing the scion cultivar.

Grafting tips

Start with good seed. Poor quality seed can lead to bad germination, increased risk of disease and inconsistent seedling growth — all of which will make grafting much more difficult.

Always run a small trial before using a cultivar for the first time. Sowing a few seeds and growing them to grafting size can help to determine the cultivar's germination rate, growth rate and consistency.

Seed the rootstock variety two days after the scion variety. Rootstock cultivars have vigorous growth and, therefore, grow faster and reach sufficient stem diameter

▶ CONTINUED ON PAGE 18

▶ GRAFTING FROM PAGE 17

for grafting earlier than scion varieties.

The grafting process

Twenty days after sowing the scion cultivar the seedlings of both the scion plants and rootstock plants should have a stem diameter of approximately 2 mm (although there will likely be some variation) and are now ready to graft. While it is possible to graft older plants, younger plants heal faster and have a higher likelihood of surviving.

The first step in the grafting phase is to choose a scion plant and a rootstock plant with compatible stem diameters (Figure 2). It is important to graft plants with very similar stem diameters to achieve the best success. Stem diameter measurements should be taken below the cotyledons for both the scion and rootstock plants.

Then the scion seedling should be cut at the same angle as the rootstock seedling was cut.

The next step is to cut the rootstock below the cotyledons. Cutting below the cotyledons eliminates advantageous shoots from growing out of the rootstock. The cut can be done using a razor blade at a 45- to 60-degree angle with a deeper angle allowing for greater surface for the graft to take hold. Then, a transparent silicon channel grafting clip should be slipped onto the freshly cut rootstock stem so that the top half of the channel is left empty.

Then the scion seedling should be cut at the same angle as the rootstock seedling was cut. The top part of the grafting clip should then be pulled open slightly so the scion stem can slip in. The cut surfaces of the two stems should now be in perfect contact with each other with no gap between them.

Important advice

Start with good seed. Poor quality seed can lead to bad germination, increased risk of disease and inconsistent seedling growth — all of which will make grafting much more difficult.

Always run a small trial before using a cultivar for the first time. Sowing a few seeds and growing them to grafting size can help to determine the cultivar's germination rate, growth rate and consistency.

Figure 1. A tray of rootstock (left) and scion (right) seedlings before the grafting process has begun.

Seed the rootstock variety two days after the scion variety. Rootstock cultivars have vigorous growth and, therefore, grow faster and reach sufficient stem diameter for grafting earlier than scion varieties.

Choosing a transparent grafting clip that is slightly smaller than the seedling stem diameter, will allow for the union to be tight and will give more visibility to the grafted area.

Transparent grafting clips in use

When making the cuts, it is important to use a sharp surface such as a new razor blade, recently sharpened knife, or new grafting blade placed on a grafting tool. Grafting tools are commercially available and help to ensure perfectly uniform cut angles.

The healing process

With the graft operation complete, the next steps are to prepare the plants for healing. The goal is to at first keep the newly grafted plants at near 100% humidity with low light. As the union heals, the plants will slowly be acclimated to lower humidity and higher light conditions.

To begin, the grafted plants should be placed onto a tray with drainage holes. A second tray, without drainage holes, should have a small amount of water poured into it, but not enough to go above the ridges in the bottom of the tray. The small amount of water in this tray will be a source of humidity and will allow the grafted plants to have nearly 100% humidity during the healing process. If the water does reach the rockwool cubes then the water will be wicked up, transpiration will occur in the newly grafted plants, and the grafting union will break.

Afterwards, the tray of grafted plants

The scion seedling should be cut at the same angle as the rootstock seedling was cut.

should be placed on top of the second tray, making sure the water does not reach the bottom of the tray with plants. Next, a clear, plastic humidity dome should be placed over the trays and the dome and trays should be wrapped in plastic wrap to prevent any humidity from escaping. The sealed dome should then be placed under a bench in the same growth chamber where the seedlings were grown.

It is important for the healing plants to have some light, but if the light is too strong it can heat up the leaf surface causing transpiration and thus breaking the grafting union. By placing the plants under a bench, a portion of the light is filtered out so the healing plants get approximately 60 μmol·m-2·s-1 for 16 hours/day leading to a daily light integral of 3.5 mol·m-2·d-1. A shade cloth could also be hung in the chamber to the same effect.

After the plants have been kept under these conditions for four days, it is time to start acclimating the plants to the outside environment. Four days after grafting, two large lateral slits should be cut into the plastic wrap where the dome and the trays meet to start letting some of the humidity out. One day later, the plastic wrap should be removed and on the next day the humidity dome should be cracked open slightly to continue to acclimate the plants to the outside conditions. On the seventh day after grafting, the humidity dome can be removed and the plants can be moved onto the benches to expose them to higher light levels. The grafting clip will

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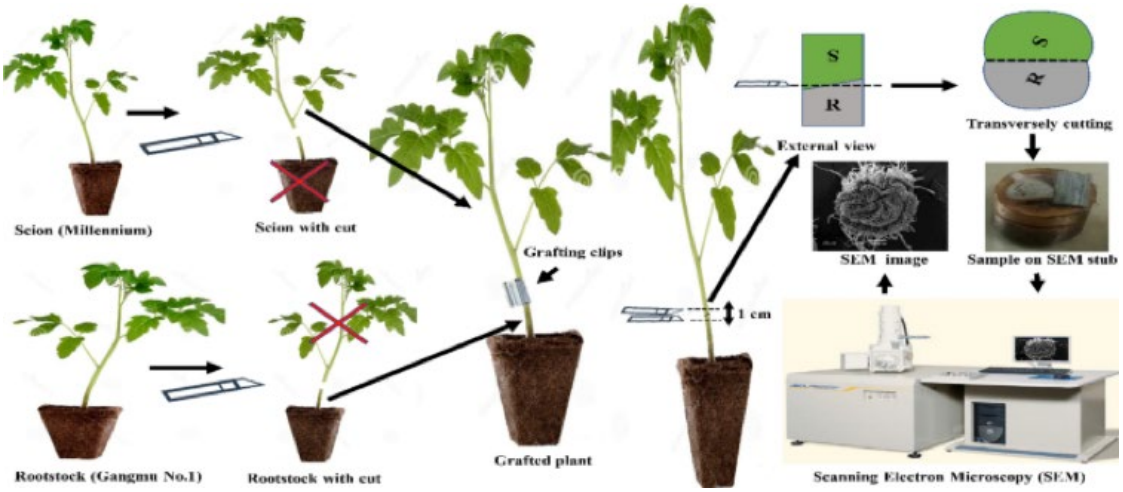
Figure 2. A rootstock (left) and scion (right) seedling with compatible stem diameters for grafting.

Transparent grafting clips in use



most likely have fallen off by this point, but if it hasn't it should be removed manually.

At this point, the plants should be acclimated to the growth chamber conditions and can now be transplanted into rockwool blocks or larger pots. Two weeks later, the tomato plants will be ready to be transplanted onto rockwool slabs (or into other soilless media) and brought into the greenhouse or high tunnel.

In larger-scale grafting projects, a climate-controlled chamber with a fogging system that can achieve nearly 100% humidity can be used in place of the humidity domes.

The trays and humidity domes can be reused multiple times; however, it is crucial to thoroughly wash and sanitize them before reusing. Although the grafting process can take some time and effort to perfect, the team at Cornell reports 95 to 100% success when using these steps. In general, growers can save a lot of money, greatly increase the quality control, and learn a very useful skill by grafting their own tomatoes.
Source: Neil Mattson et al; CU.

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