

ANTHURINFO



The new irrigation

When finished plants leave the nursery, they often start a long journey before ending up on the consumer's windowsill. How do you get the maximum performance in plant health?



Anthura Ferrara, a new champion in the yellow segment



Milanello® at the World Expo in Milan



The control for the 'critical consumer'

The new irrigation

During the growing phase of young plants into a beautiful end product, a lot of attention is given to climate and irrigation. This is necessary to obtain the best results in a minimum of time. The final result is a strong and healthy plant with several open flowers which reaches its maximum splendour during further growth.

However, this is when things often go wrong. When finished plants leave the nursery, they often start a long journey before ending up on the consumer's windowsill. When considerable circumstantial problems arise during this journey, they sometimes do not even reach the windowsill. Unfavourable circumstances during the journey can often include not enough light, too much ethylene gas, too low or too high a temperature and, when the journey lasts too long, drying out.

The first issues are often the subject of research; however, drying out is often the cause of poor shelf life later on in the process.

Irrigation during Anthurium cultivation

Water is fundamental for optimum plant growth. When a plant does not grow well, it will also be more prone to other attacks such as diseases. During cultivation, the cultivation manager of the nursery often waters the crop every day to provide the finished plants with water and fertilisers. During the transport route, which often lasts 3 to 10 days, the plants do not receive any water. Later on, in the retail chain which can also last for days, they are rarely watered.

When a customer buys the plant, it often does not receive the ideal amount of water as in the nursery. The label indicates that the plant should be watered regularly, yet not too much. However, the question is what is 'regularly' and what is 'not too much'. This needs to be improved...

WaterWick

During a visit to the Flowertrials 2014 I came across the WaterWick by Viscon. The WaterWick is a wick made of special

cotton that absorbs water easily and hence has a good capillary action (ascent of liquid in narrow channels). This WaterWick can transport water from a tank to the cultivation medium. This is shown in the figure below:



At first I was sceptical about the simplicity of this 'wick'. Mark van Voorthuisen from Viscon gave me several samples and at home I tried them in 6 cm Anthurium pots.

What struck me immediately was the simplicity of the process. Once you have applied the WaterWick, you only need to keep an eye on the amount of water in the pot. The WaterWick transports the water every second into the pot, thus regulating the irrigation frequency.

Happy Plant Zone

But the most important thing was that the Anthurium also continued to grow. The plant stayed in its 'Happy Plant Zone' and produced new leaves and subsequently also new flowers. It became fuller and fuller. The only thing I needed to monitor was the water supply. As long as this is kept to the right level, the proper amount of water necessary for optimum growth will be provided.



Irrigation during orchid cultivation

In the case of pot orchids, irrigation is challenging for the consumer too. Water runs quickly through the pot, and immersion of the plant is often too much work. The irrigation advice as regards the amount and frequency on the label is equally unclear, as with Anthurium. A simple and effective way of watering with the WaterWick should be also possible for Phalaenopsis. At home I started to carry out tests by introducing a WaterWick into the strong capillary cultivation plug of Quickplug, which we use for growing young plants. The idea is simple, yet the results turned out to be extraordinary.

Convenience



The combination of the WaterWick and the orchid plug ensured that the water was transported to the roots and well distributed over the pot. When you apply the WaterWick alone between the bark parts, the connection is often not good and the water cannot reach all areas. By using the plug, a reliable combination arises. This is necessary because consumers do not want to devote too much time

and attention to our carefully cultivated plants. We have to offer consumers convenience. Anthurium and Phalaenopsis are solid, straightforward plants. The combination with the WaterWick and a water tank ensures that the plant care goes 'automatically' well in the retail chain and that it will be much easier for consumers to look after this plant at home.

Water tank

Now that the quantity and frequency of the irrigation have been solved, we still have to face the challenge of the water tank. When the finished plants are provided with a WaterWick, this wick will transport the excess water that runs through the cultivation medium (peat or bark) and collects at the bottom of the pot directly back to the medium and the roots. This is already an improvement compared to a pot without a WaterWick. If the water tank under the pot can be enlarged, there will be sufficient water for one to several weeks depending on the tank size.

Tests

We are currently testing several types of pots with a tank

and the WaterWick to measure how much water the plant evaporates. We are also testing pots with a very transparent tank, so you can easily see if water needs to be added, or with a water level indicator which is as often used in hydroculture. During these tests we are looking for solutions to enlarge the tank. The easiest solution is to lower the growing pot. Viscon has a prototype of this pot and at Anthura we have grown Anthurium in this low 12 cm pot. This does not present any problem for the cultivation.



Saving

A major advantage is that the pot contains only 50% of the amount of substrate that is used normally. Following requests from NGOs to use less peat in Europe, we now suddenly have a solution that saves 50%. The wick and water costs are negligible compared to the peat substrate. Following tests on the Anthurium, the Phalaenopsis is now also being tested in a low pot. Both Anthurium and Phalaenopsis are epiphytes and do not need much substrate, because epiphytes grow on tree trunks or stones.

Large tank

By combining the low pot and a visible tank, you get the ideal combination of water during transport and a clear indication of when the plant needs water again in the store or at home. The consumer does not have to worry about it for weeks, because with this combination it can be sufficient to water just once a month. If we enlarge the tank even more, you can go for months with the water tank. This is the solution for offices, for instance, where maintaining plants is often considered to be problematic.

If you're interested in the broad range of possibilities offered by WaterWick or in starting to use it yourself, please contact us or Viscon at (www.viscon.eu)

Marco van Herk

Commercial Director

Aristo®

Anthura has yet another red champion. I can already see you thinking: “Not another red one, there are already so many!” The Anthura breeders are passionate about their work and this leads continuously to qualitatively and aesthetically better and more beautiful varieties.

The total share of the red segment is still around 60% of the market, but not too many varieties in the same colour should be placed on the market. Therefore we strongly believe in upgrading the assortment.

Aristo is a variety of an even higher level and will therefore start replacing other varieties on the market. It has it all. It is cold tolerant, it has a beautiful leaf quality, it flowers abundantly and the leaves have an extraordinarily stunning gloss.

Normally, the older flowers lose some of their colour. This is not the case with Aristo, as a result of which the plant stays beautiful for longer. If you factor in the long shelf life of the plant, this is a real asset to the red assortment. The production of Aristo will really start in 2016 and will be available for testing from that time.

An opportunity that you just cannot miss!

Richard Smit

Sales Manager & Product Manager, Anthurium pot plants



Aristo® (ANTHERBI)

 Colour	red
 Flower size	medium
 Pot size (cm)	9, 12 and 14



Pantone 032C

Travelling in Russia

In September we participated once again in the trade fair held in Moscow: Flowers Expo 2015.

In view of the exchange rate of the rouble and the international political situation, I was not exactly sure what I could expect. Given that I had almost 50% less to spend, a trade fair visit would probably not be one of the priorities on my agenda, let alone buying flowers or plants. The interest was much higher than I expected! I met florists, wholesalers and a very interested audience. The latter are perhaps the most important, as they are the end customers.

What I saw there, I had not seen at other trade fairs for a while: real emotions at the sight of all those beautiful flowers and plants. Isn't that the most beautiful thing we can achieve with our products: transferring and evoking emotions? It is really not the same as a box of chocolates.

In the Netherlands, the following marvellous slogan has been used for years: "Flowers love people" and vice versa: "People love flowers". I saw a lot of people getting happy with all these beautiful things from Holland. And this makes me happy (and proud) too!

In the Netherlands, the production country, perhaps we have lost sight of the emotion, but isn't this the perfect approach that you can wish for your product? Let's start focusing again on this aspect in Holland, the flower country!

Rick Kroon

Commercial Manager Export



Stand Flowers Expo 2015



Switch over from pricking-out trays to plugs for Phalaenopsis

Since the introduction of our Phalaenopsis plants in plugs, a lot of experience has been acquired with growing and cultivation in plugs. In the meantime, the demand has increased considerably.

Anthura has always focused on our customers' demands and this was a determining factor for us when it came to producing plugs or nursery trays.

For deliveries in 2016, the entire demand sector is ordering plugs. This has made us decide to change our cultivation as from 1st August 2015 entirely to plugs and to stop growing Phalaenopsis in nursery trays. This means that in the first half of 2016, we will gradually change to the entire delivery in plugs. It may happen, though, that some varieties will be temporarily delivered in pricking-out trays. Tips and tricks for a prosperous cultivation of plugs in a 12 cm pot were discussed in the last Anthurinfo.

With the complete changeover to plugs and the recent expansion of the greenhouse at Anthura Arndt, Anthura is totally ready for the future!

Robert Kuijf

Product Manager, Orchids

Anthura Arndt celebrates its 20th anniversary

On Friday 18 September, Anthura Arndt celebrated its 20th anniversary with a big party. Besides the traditional German 'Kaffee und Kuchen', buffet and festive evening, guests could also visit the new greenhouse.

Since the beginning of Anthura as a family company in 1972, specialising in Anthurium, its activities have progressively expanded over the last years, always with a clear specialisation in product groups. The takeover of Anthura Arndt in 1995 was clearly a milestone, because it resulted in the expansion of the product portfolio with Orchids. The last time that so many people were gathered at Anthura Arndt was in 2006. That was to celebrate the opening of the then new greenhouse. Meanwhile, Anthura Arndt has not stopped expanding and recently finished its last new 2.5 ha building.

Many associates who were present at that time also attended the anniversary celebration. We have come a long way with these customers and have made several changes and innovations in the intervening years. The new 2.5 ha building is symbolic of the dynamics of the last 20 years. Thanks to the expansion of Anthura Arndt, we can supply our customers with the required amounts of the required varieties.



Moreover, with the option of an expansion by another 2.5 ha, we can continue to develop further in the market.

There was a huge range of guests at the party: national and international Phalaenopsis customers, suppliers, neighbours, associates and members of staff. This diversity is illustrative of the way Anthura wants to conduct its business: in close involvement with associates in the immediate area as well as



with customers throughout the world. The theme of this festive day was the 'Oktoberfest', which was chosen because it is a real family celebration and a typically German theme. The international reputation of this theme was also taken into consideration. This international approach also reflects our own international way of conducting business.



The marquee was entirely decorated in blue and white: the colours that correspond to the German beer festival (Oktoberfest). In addition to the matching Phalaenopsis colour accents (white and blue plants), the music, food and drinks as well as the service were fully in style. The guests were welcomed with typical 'Kaffee und Kuchen'; cakes prepared and served by the in-house staff in the most fantastic way. Following the official opening of the evening and after the first beer keg had been opened, guests had the opportunity to visit the new 2.5 ha building and to enjoy the buffet. Of course, a real German party evening would not be complete without typical Oktoberfest music!

Anthura Arndt can look back on a very successful anniversary celebration.

Laetitia de Goeij

Marketing & Communications

Anthura Ferrara: a new champion in the large-flowered yellow segment!

Despite the fact that yellow only represents 5%-10% of the production volume of Phalaenopsis, it is still an important colour for the mix. The colour yellow contrasts with other colours and makes sure they stand out better.

With the trend towards increasingly larger flower sizes, there was also a need for a new large-flowered Phalaenopsis in the yellow colour segment with a flower size of more than 9 cm. The new Anthura Ferrara variety fully satisfies this need!

With its flower size of at least 9.5 cm and its compact plant height of 60 cm, this new yellow champion can be combined perfectly with other varieties in the taller segment such as Anthura Cambridge, Anthura Sacramento, Anthura Göteborg, Anthura Monza, and Anthura Woodstock.

With a standard cultivation period of 46 weeks, the variety produces 70% of plants with two spikes. The shelf life has been tested several times and is on average 13 weeks, including one week of transport simulation.

If you have not yet received Anthura Ferrara at the nursery, please ask your sales or area manager about availability.

Robert Kuijf

Product Manager, Orchids

Anthura Ferrara (PHALDRAXIP)

📏 Colourcode	YELYX
🌸 Flower size in cm	9.5
↑ Height in cm	60
🪴 Pot size in cm	12



Milanello®

World Expo Milan: how wonderful is it to make contact with flowers and plants during this fantastic event! And to inspire visitors with the magnificent colours and shapes of Anthurium and Phalaenopsis. The ideal setting for the introduction of a new cut Anthurium variety: Milanello®!

A powerful, recognisable name with a nod to the city that is packed with inspiration. Just take a look at the fashion and design industry, and of course football as entertainment.

The 'club' colour of Milanello is 'fashionable purple', a real eye-catcher combined with its natural high gloss. Another strength is its production capacity of more than 100 units/m². In addition, a major part of the flower production has the ideal size of 13-15 cm.

“The combination of colour, gloss and flower size is intensified by the almost perfectly shaped bract”

The bract is also somewhat thicker than the average and therefore also really firm. The position of the spadix makes it an easy flower to pack.

With respect to shelf life, Milanello can be compared to Tropical®. Both varieties score highly with an average shelf life of 23 days.

Finally, another two important advantages: during breeding it was noticeable that there was a very low percentage of inferior quality plants. In addition, Milanello has quite a compact leaf which retains its beautiful dark green colour. By cutting a leaf every now and then for the sale, you can increase your return. You can, of course, also opt for the young leaf breaking method.

Milanello, versatile, glossy and outstanding!

Hans Prins

Sales and Product Manager, Anthurium cut flowers

Milanello® (ANTHIPADO)

🌿 Colour:	purple
🌸 Flower size:	13-15 cm
🌱 Production per gross m ² /year	100 units
🗑️ Shelf life:	23 days

Flowers @ World Expo

In 2015 Milan had the honour of organising the World Expo, the main topic of which is Feeding the Planet, Energy for Life!

150 years of innovation

The World Expo has been organised since 1851. This five-year tradition goes back more than one-and-a-half centuries! At the Expo, the participating countries present an image of their economic, social, cultural and technical evolution. Unique 'landmarks' are often especially developed for an Expo. The most famous is still the Eiffel tower, which was built for the 1889 edition. The previous edition was organised in Shanghai. The astronomical number of 70 million visitors was recorded in this metropolis! Truly a grandiose and global event.

Energy for Life

In Milan, the pavilions of the participating countries are ranged along an impressive long street. Each is more beautiful and magnificent than the last. Each country has a unique appearance, highlighting its typical identity. At the same time, special attention is given to worldwide food problem and ideas exchanged for a sustainable future. The Expo runs from May till the end of October and more than 100,000 (!) visitors are expected to access the site daily. An event where flowers and plants should not be missing!

Share, Grow, Live

The theme of Holland is Share, Grow, Live. This theme is interpreted in different ways. Visitors are taken to a world of agricultural developments, sustainable solutions and the circular economy. For this edition, the Netherlands did not opt for a large building, but for a setup that reminds us of the Parade. Several food trucks where typical Dutch dishes such as "poffertjes" and "bitterballen" are served alternate with a Ferris wheel, a hall of mirrors and a stage for live music.

In the Greenhouse, technology and health come together. A second reason why flowers and plants should not be missing.

Floral Happiness

Anthura, in collaboration with Royal Lemkes and Beekenkamp Groep, was responsible for the decoration of the large tent as well as the Greenhouse. By processing orchids and Anthurium combined with chrysanthemums, among others, visitors

are given the warm feeling of giving and receiving flowers and plants. This is translated into well-known occasions for giving and emotions such as love, birth, marriage and also 'Grandparents' day'. The latter festivity (Festa dei Nonni in Italian) is now a fixed item on the agenda in Italy and is therefore given extra attention at the beginning of October.

But there is more. Visitors will not only be able to enjoy the flower and plant arrangements, but also from the Expo they can send a digital bouquet to their loved one, friends or family. The recipient will receive a personalised message at home. This will give the Netherlands, its industry and our products the attention they deserve. And is there anything more beautiful than letting the on-line and off-line world merge together? Sharing Floral Happiness!

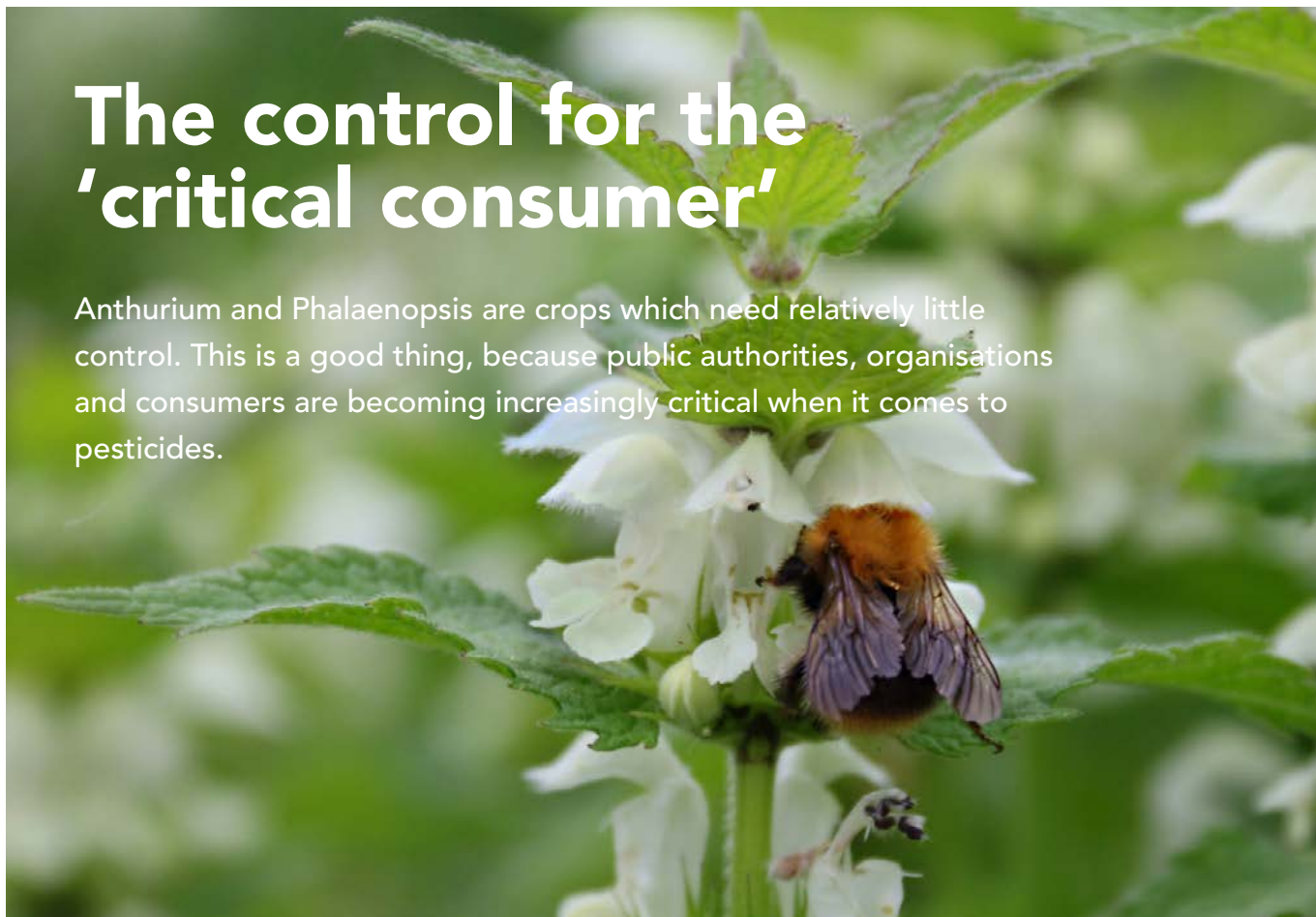
For more information about the World Expo, please visit www.worldexpomilaan2015.nl and <http://www.expo2015.org>



CULTIVATION TECHNIQUE

The control for the 'critical consumer'

Anthurium and Phalaenopsis are crops which need relatively little control. This is a good thing, because public authorities, organisations and consumers are becoming increasingly critical when it comes to pesticides.



For targeted cultivation advice on Anthurium and Phalaenopsis pot plants and Anthurium cut flowers



Developments in the control of pot worm in the Phalaenopsis cultivation



The control for the 'critical consumer'

Anthurium and Phalaenopsis are crops which need relatively little control. This is a good thing, because public authorities, organisations and consumers are becoming increasingly critical when it comes to pesticides. They are calling for manufacturers to stop using certain pesticides. Therefore it is important to keep these demands clearly in mind and to start looking for alternatives, where necessary.

Neonicotinoids and bees

Although several factors contribute to the drop in the bee population, numerous investigations associate neonicotinoids with the decline in bee health. Neonicotinoids are insecticides with one of the following active substances: imidacloprid, thiamethoxam, thiacloprid and acetamiprid. This involves products like Gazelle, Admire, Gaucho Tuinbouw, Merit Turf, Sombrero, Kohinor 700 WG, Potatoprid, Wopro Imidacloprid 70 WG, Calypso, Exemptor, Sonido, Actara, Cruiser and Poncho Beta.

What makes the neonicotinoids so harmful for the bee is it is systemic and remains present for a long time. Systemic

means that they are absorbed by the entire treated plant, as a result of which they also end up in the nectar and the pollen. And the bees eat the nectar and the pollen.

Due to the systemic nature of these products, spraying later during the day or not spraying the flowers will not have any positive effects for bees. Therefore, the use of neonicotinoids is already forbidden in many countries for outdoor cultivation.

Several major environmental organisations, including in the Netherlands and Germany, are striving to ban the use of neonicotinoids in horticulture as well. This is not because of the bees in the greenhouse, but due



Pollination by bees and bumblebees

to the excess of permitted values in the surface water, the use of neonicotinoids must also be prohibited in greenhouses according to the organisations. With half a teaspoon of imidacloprid you pollute a one-metre-ditch over a length of 200 kilometres. Under these circumstances, this substance can be present in the water for months or even years. Until recently,

in the Netherlands, neonicotinoids were available to consumers. The consumer has no idea that a small amount of this agent can easily lead to the pollution of a large surface area.

Duty on water treatments

For several products, including imidacloprid, a water treatment duty applies in the Netherlands. When using these products for horticulture, it is mandatory to treat the water. In the not-too-distant future, environmental organisations want to make this compulsory for all the neonicotinoids and even for all the water used by growers.



Water purification

Several major sellers have also tacked as a result of social pressure. Under this pressure, growers are being forced not to apply the products. For this reason, more and more buyers have stopped buying products with certain pesticides and it is expected that several of these products will be banned in the long term.

In addition to the neonicotinoids, this also concerns pesticides with active substances like chlorpyrifos, deltamethrin, fipronil, cypermethrin and clothianidin in parts of Europe.

Thanks to better analysis techniques, it is possible to detect even small values of different pesticides. Particularly persistent products remain present in the crop for a long time and can be found long afterwards.

Alternative means

The above particularly relates to insecticides which can be replaced by other chemicals. Due to the smaller packaging of products, however, it gets more difficult to control insects like thrips and lice. What also complicates this control is the fact that in the Netherlands an agent may often only be used a limited number of times a year.

In short: the pressure for smaller packages of agents increases and the agents have to be used in a very efficient way. We must also look for a form of integrated insect control.

Biological agents

It is increasingly possible to control insects with biological controls. Several suppliers are delivering more and more products that can be used in the Anthurium and Phalaenopsis cultivation. Through research, better biological pest controllers are being discovered and then launched on the market.

In the Netherlands, growers in the Anthurium cultivation usually work with one or more biological controllers in integrated cultivation. Chemical agents are often used to correct, where necessary, or to hose down the crop. Ironically, it is sometimes necessary to kill the biological pest controllers to enable exportation.

Swirskii

In the cut Anthurium cultivation, growers in the Netherlands usually opt for setting out Swirskii to control thrips. By hanging out controllers in bags, it is possible for them to be released over a longer time period. Because of this, there will be a population of biological controllers in the greenhouse during several weeks without prey. Generally, bags are hung out

every six weeks until the autumn. In the autumn the crop is hosed down, so you can start again with biological controllers in the spring when the insect pressure is low.

Swirskii from different suppliers:



Swirskii bag of Koppert



Swirskii bag of Syngenta



Swirskii bag of Biobest

Insect parasitic nematodes

In the case of pot Anthurium, plants stay in the nursery for a shorter period of time and bags are not appropriate for plants to be delivered. Because usually there is an irrigation pipe or a spray boom, controls with nematodes are perfectly possible and effective here. Nematodes are distributed over the crop via the irrigation pipe after stirring well and by dosing them in the evening, they can start searching the wet crop after a while for thrips, which will then be infected.

Nemasys F and Entonem are products that contain insect-parasitic nematodes of the *Steinernema feltiae* species. These are biological products for controlling thrips and fungus gnat (*Sciara*).

Insect-parasitic nematodes can be applied to both the crop and the soil. Under humid conditions the nematodes detect the pest and penetrate it. A bacterium carried by the nematodes, infects the harmful insects and then kills them. The nematodes are active against larvae and adult thrips via a leaf application. When applied to the soil, it is also possible to control thrip pupae. For good eelworm control, it is often necessary to apply nematodes on a weekly basis.

In Phalaenopsis, nematodes can be used to combat the fungus gnat (*Sciara*).



Nematodes against thrips

Macrocheles robustulus

In both Anthurium and Phalaenopsis cultivation, a predatory mite like *Macrocheles robustulus* can be used to break the thrip cycle. This is possible for thrips that pupate in the substrate (see also Anthurinfo 2012-3 about thrips). The product Macro-mite contains the predatory mite *Macrocheles robustulus* which is effective against thrip pupae, eggs, larvae and pupae of fungus gnats (*Sciara*). The predatory mites also eat soil-dwelling insects, such as springtails, nematodes, eggs of *Duponchelia fovealis* and moss mites (Oribatida). The product is not sensitive to several chemical crop protection agents. The mites can be observed on the soil and around the plant base. *Macrocheles* is not found in the plant.



Macrocheles robustulus



Swirskii (Koppert Biological Systems)

Frequency of setting out biological controls

The *Macrocheles* settles in the substrate and will be present for a long time in the substrate without controls. The *Swirskii* and nematodes do not settle in the crop, so that the regular application of a new population of controllers is important. These different pest controllers will not damage the crop.

Therefore it remains possible to continue providing the "critical consumer" with a qualitatively good product using other control methods without overly increasing production costs.

Hans van Eijk

Consultant Bureau IMAC Bleiswijk B.V.

Developments in pot worm control

The pot worm has been present for many years in the Phalaenopsis cultivation. Fifteen years ago, pot worm control was already a topic of discussion with Phalaenopsis growers. At the time, it was not a major problem. It is significant that back then it was already being recommended to hang a lot of light traps (1 per 200 m²) to control the pot worm mosquitoes, then called Orfelia.

The pot worm has now become a pest. With many Phalaenopsis and other orchid growers, the population of mosquitoes and larvae in the crop (greenhouse and substrate) has become quite substantial in some cases. So substantial, that many plant roots are affected and there is clear growth retardation. Controlling the pot worm is difficult. Chemicals are (almost) not available.

What is the answer?

In order to control the pot worm properly, it is necessary to know which enemy we are dealing with. This requires a lot of attention. And this begins with observing the collection of mosquitoes caught in the light traps.

The researchers at the WUR have been identifying an increasing range of different mosquito species from the traps delivered by IMAC and Anthura, amongst others, after collecting them at several growers.

Origin

The identified mosquitoes seem to be native to South and Central America. The mosquitoes found in the greenhouses which cause damage as larvae have most probably come along with the substrate and/or plant material.

Species

To date, most pot worm species belong to the Keroplatidae family (fungus gnats) such as *Lyprauta cambria*, *Lyprauta chacoensis*, *Orphelia* sp and *Proceroplatus trinidadensis*. Other mosquitoes are also caught, such as crane flies (Tipulidae) and fungus gnats (Sciaridae).

"Spot the differences"



Lyprauta chacoensis



Proceroplatus trinidadensis



Pupa



Larva

Life cycle and way of life

The life cycle of these crane flies is relatively long (in comparison to Sciaridae, for instance). In the greenhouse, however, a large population is quickly built up. As far as we know, the life cycle of pot worm species has never been entirely mapped out. The diagram below indicates the stage of data as is now known:

Phase	Duration in days	Remarks
Pupa	4-8	Depending on the temperature
Mosquito	2-5	In this short time, the mosquito mainly lays its eggs
Egg	7	Very unclear. 7 days on average is considered
Larva	21-35	Depending on conditions such as moisture and temperature

The eggs and pupae are often deposited in the cultivation substrate. The pupae are usually surrounded by a sort of spider web with moisture droplets.

As long as the pot is wet, the larvae live mainly on the outside of the pot (between the substrate and the inner surface of the pot). As soon as the substrate gets dryer, the worm moves up to the pot centre (substrate). The larvae move along very acid slime threads (pH < 3). The larvae almost never move directly along parts of the substrate. After the pupae emerge, the mosquito moves upward through the medium and will start to fly. The mosquitoes move mainly in the evening and at night. The female lays its eggs in a short time. It prefers a moist surrounding for this (moist substrate).

Impingement

The pot worm is mainly found in the growing phase. Two or three weeks after potting, the first larvae are found in the substrate. Subsequently, the number of mosquitoes and pot worms increases quickly. This also applies to the damage, which is characterised by erosion or chunks out of the root tip.



Impingement by pot worm

The plant responds to this by producing new root tips. Usually, by sprouting several root tips slightly above the affected root tips. The growth retardation of the plant relates chiefly to weak absorption of water and nutrients by the root tips in the first weeks of the cultivation and to the extra energy that is needed to produce new root tips.

Prevention and control

Little is known about the pot worm. It is unclear which larvae (mosquito species) can be related to the damage. Observing and counting the mosquitoes in the light traps also shows that sometimes a lot of mosquitoes are counted while no damage is observed in the crop.

Solving the pot worm problem focuses on three main spearheads:

- A good understanding and identification of mosquitoes for focused control (watching is knowing);
- Preventing the entry of the pot worm;
- Control of the internal infestation (population).

Knowledge and identification

Anthura and IMAC support the research being carried out on the identification of the mosquitoes. It is still unclear which damage is caused by which mosquito larva. There are still new mosquitoes being found, of which it is unclear whether their larvae cause any damage.

Their behaviour and way of life can vary considerably. It is known, for instance, that pot worms are cannibalistic. They eat their own conspecifics. The question is, however, whether each species is cannibalistic as a larva. In addition, there are indications that the “pot worm” is actually an insect or mould-eater rather

than causing direct damage to the root tips. It is unclear, however, whether we are always talking about the same mosquito.

Therefore, it is important to study more thoroughly the appearance and behaviour of the mosquitoes and the pot worms in the pot.

No pot worms in delivered plants and substrates

The pot worm (pupa, egg, larva) can also enter the crop through the plant material and the substrate.

Suppliers of substrates have taken measures to keep tighter control over substrates without any risk of pot worms (pupae).

As regards the delivered plants, in the near future most plants will be cultivated in plugs. As yet it seems that the pot worm is not able to develop in the plug.

Control of internal infestations

No more chemicals of the type that control the older worms properly are allowed. Space treatments for killing the mosquitoes also ensure insufficient control. Young worms are more sensitive to pesticides. Shortly after potting, pesticides can still have some effect.

Crop changes

Changes in the crop and in the growing conditions can help to keep the pot worm under control. There have been confirmed results with regard to the drier cultivation method. Postponing the irrigation session ensures that the substrate continues to dry. There is too little moisture for the pot worm to move. Drier cultivation has some effect, although it is usually temporary. Using the drier cultivation method continuously will be at the expense of plant quality. Dosing a wetting agent with the irrigation water accelerates the drying of the substrate. It is suspected that the

wetting agent makes it difficult for the pot worm to make slime trails or that the existing slime trails are dissolved.

Biological agents

Controlling the pot worm with biological agents seems to be very difficult so far. This does not mean that these biological pest controllers do not control the pot worm. Laboratory research showed that nematodes are able to control the pot worm larva properly. Results can also be expected from the application of predatory mites. Not being able to control the pot worm properly in practice often relates to the size of the pot worm population (mosquitoes) and/or the method of application. Let's give an example. Years ago, Anthurium was unable to control the thrips in the cultivation properly through biological methods. Now, the thrips can be controlled perfectly by using predatory mites and nematodes.

Parasitic wasp

Watching, watching... and surprise. The researchers at the WUR would like to set up a cultivation of pot worms in order to establish more links between mosquitoes, larvae and damage.

Looking closely at the larvae and pupae delivered by Anthura, a pupa was found at the WUR that was parasitized by a parasitic wasp. The pupa concerned was found in the Cambria crop at Anthura. Soon, other parasitized pupae as well as the parasitic wasps were discovered.

Parasitic wasps look for and parasitize pot worms in an aggressive way. In the cold section where the parasitized pupae were found, it turned out that the parasitic wasps multiplied rapidly (within a few weeks) and had parasitized the pot worm population by about 90%. All efforts are being mobilised to learn more about this parasitic wasp and especially the breeding

of the parasitic wasp with the expertise of WUR and Koppert, amongst others.

Light traps

The installation of sufficient light traps is proving to be increasingly effective as a means of control of the pot worm. The purpose is to catch the mosquitoes before they start laying eggs. Practice shows that the mosquito population decreases steadily when the blue light traps are installed.



Parasitic wasp found at Anthura

We are increasingly seeing situations in which the effect of more light traps effectively leads to fewer mosquitoes and as a consequence no damage by the pot worm.

It is recommended to install a minimum of one lamp per 150 m². With sufficient light traps per surface area, the distance between the mosquito and the lamp is smaller and it is more likely that a mosquito is caught before it lays eggs.

Eradicating the pot worm completely will not be achieved only with light traps. For this reason, a simultaneous control of the pot worm itself is necessary. With a low pot worm population, a biological control can clearly have more effect.

Catch and count

Most mosquitoes are caught at night. The ratio between day and night is approximately 20:80. A sticky trap is placed in the collecting tray (blue or yellow, it does not matter).



Practical situation:

In a practical situation trap lights

were installed: one per 260 m². The number of mosquitoes decreased to a level of 20 mosquitoes per lamp per 24 hours. After some time (months), however, the mosquito population increased to more than 50 mosquitoes per lamp (per 24 hours). This comes down to approximately 200 mosquitoes per 24 hours per 1000 m². It was decided to double the number of lights.

Following the installation, fewer than 10 mosquitoes per lamp were counted in a short time (= 80 mosquitoes per 1000 m²).

The mosquito that comes into contact with the light falls on the glue of the sticky trap and will be stuck. It is possible that mosquitoes that have been in contact with the blue light will continue flying. In addition, the collecting tray can be cleaned more easily by using a (sticky) trap on the bottom.

It is recommended to count the number of mosquitoes in the light trap once a week. Clean the collecting tray and put a clean sticky trap on the bottom. Count the number of mosquitoes on this sticky trap 24 hours later. This will give an insight into the increase or decrease of the mosquito population and the possibility to compare with other departments or growers.

Control by installing light traps is universal. The flight behaviour of different mosquito species may also vary. But, in principle, the light catches large and small mosquitoes. *Sciara* are also trapped well.

Type of lamp and installation

It does not seem to matter that much which type of light trap is installed. The size of the lamp, however, does influence

the scope of the light. It is likely that with two smaller light traps as many or even more mosquitoes will be caught than with one big light trap. The intention is to install as many lamps as possible per surface area so that the 'flying' distance gets smaller.

Abroad there are also *Phalaenopsis* growers who have installed light traps with fans. The goal is to suck up the mosquito near the lamp (blue light) by means of a powerful fan. The mosquitoes are caught in a bag under the fan (lamp). One single test in the Netherlands seems to indicate that more mosquitoes are caught with these trap lights.

If you are thinking about purchasing these lamps abroad, it is important to keep in mind that the voltage and wattage may be different. An adapter or converter will be needed and this will imply extra risks in the moist greenhouse.

Observe the air humidity in the greenhouse and the irrigation system. Provide the lamps with a cover to prevent water from reaching the lamp and the electrical contacts.

When the lamps are installed, it is advisable to make a connection whereby all the lamps can be switched on and off. The grower can choose to switch the lights on and off via the computer.

As far as we know, the blue light has no harmful effect on the plant growth or shape. When vents and screens are open, it is recommended to switch off the lamps.

Watch and learn

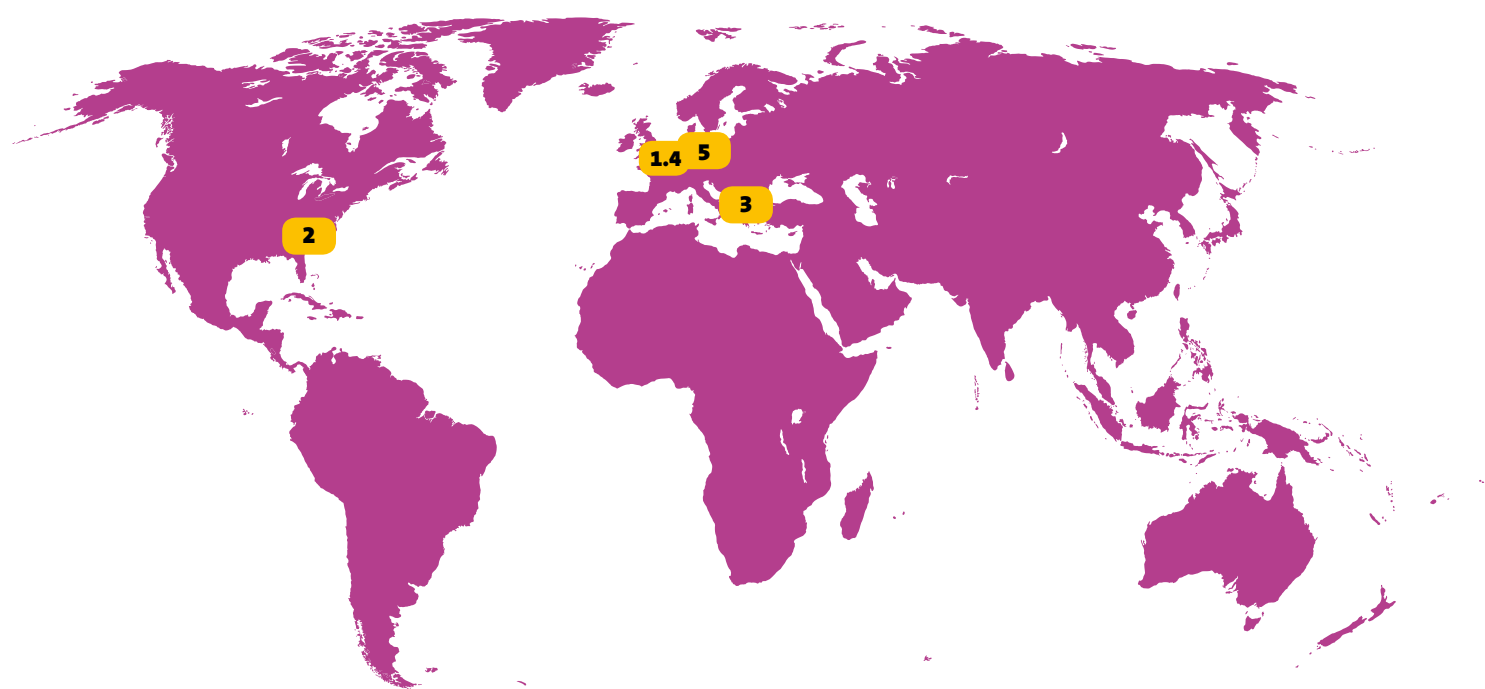
By watching regularly, you see and learn a lot. What else can we find beside a parasitic wasp? By thoroughly studying the behaviour of predatory mites, we can apply the existing biological controllers in a more effective way. Together with catching the mosquitoes, biology can be successful in the fight against the pot worm. We can also learn a lot from each other. Together we will certainly achieve more.

Ed Konijn

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Trade fairs until January 2016



1. FloraHolland Trade Fair

Aalsmeer, the Netherlands
11/04/2015 – 11/06/2015

2. TPIE

Fort Lauderdale, USA
01/20/2016 -01/22/2016

3. Flower Show Turkey

Istanbul, Turkey,
11/26/2015 - 11/29/2015

4. FloraHolland Winterfair

Aalsmeer, the Netherlands
01/06/2016 – 01/07/2016

5. IPM

Essen, Germany
01/26/2016– 01/29/2016

Colophon

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