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Journal for breeders and producers of plant material

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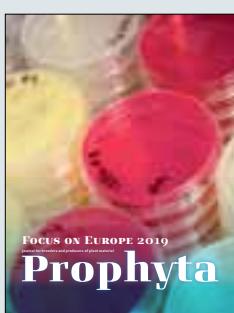
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Uniform seed health testing methods is pivotal to the seed industry

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In Short

Living sticks from Japanese knotweed simply for sale at florists

LIVING STICKS FROM THE invasive Japanese knotweed (*Fallopia japonica*) are still being traded through the Dutch

- 4 flower auctions of Royal Flora Holland and Plantion. They are also fully on offer at florists' shops, where the sticks present a risk for further spread to (unknowing) consumers.

Research by the trade journal, *Vakblad Stad & Groen* (City & Green) shows that the fresh sticks of Japanese knotweed are available for sale or can be ordered from more than half of the Dutch florists surveyed. The sticks are offered under the names of 'polygonum sticks' or 'Dutch bamboo'. Both the Plantion flower auction and Royal Flora Holland confirmed that the living sticks can be purchased through their auction. Plantion indicated that they are working on a ban.

Within a regulatory steering committee, to which both auctions are linked, sales are being discussed, to date still without any resolution. The sale of knotweed is not prohibited in the European Union. No variant of the knotweed is on the Union's



Fighting invasive exotic species, such as Japanese knotweed, resembles mopping up with the tap running
(Photograph: *Vakblad Stad + Groen*)

list of invasive exotic species nor has it been designated as an invasive exotic species, based on the Nature Protection Act. It is however one of the 100 worst invasive species as identified by the IUCN, the International Union for Con-

servation of Nature and Natural Resources. It is a potential contaminant of soil, and its ability to tolerate a remarkable range of soil types and climates means that it has the potential to spread much further than it has to date. It has gained a fear-

some reputation for breaking through hard structures in the built environment and being almost impossible to eradicate once it has taken hold, and is often recognized as one of the most pernicious weeds in any recipient country.

Incotec presents sustainability strategy

AT 'SEED MEETS TECHNOLOGY', held from 24-26 September in Zwaagdijk, the Netherlands, Incotec presented a new theme: Mission Zero. Seed improvement and coating technologies are already contributing to more sustainable agriculture by making it possible to reduce the use of plant protection products by up to 90%. The strategic direction of Mission Zero

includes new initiatives, such as the development of alternatives to microplastics in coatings, the substantial expansion of the range of organic products, working on techniques for the successful application of biological organisms and scoping the possibilities for biodegradable coatings. During 'Seed meets Technology', Incotec organized the lecture 'Trend or Truth:

How the microplastics debate moves the seed industry'. A study by a German-Swiss team of researchers, published in the journal *Science Advances*, disclosed that even in the Arctic, microscopic particles of plastic are falling out of the sky along with the snow. The scientists found more than 10,000 particles per litre. It means that people are likely to be breathing in microplastics in the air -

though the health implications remain unclear. Incotec's R&D Manager, Marta Dobrowolska, and Product Marketeer, Brechje Veerman, addressed questions such as: Which market and consumer trends have led to the forthcoming legislation on microplastics for the seed industry and what are the consequences?

Seedmanship in the tropics

IN HONOUR OF WORLD FOOD Prize laureate, Simon Groot, the Sow to Grow interactive museum in Enkhuizen, the Netherlands, is setting up an exhibition about breeding tropical vegetables. 'Seedmanship in the tropics' shall be focused on asparagus bean, pepper, bitter gourd and ridge gourd. In addition, the exhibition will focus on Norman Borlaug, the 1970 Nobel Peace Prize winner, who gave the prize its name. The so-called 'father of the Green Revolution' was an American agronomist who bred high-yielding wheat varieties, which saved millions of people from starvation.

In addition to breeding, the exhibition also shows the importance of the distribution

of high-quality seeds, to ensure small-scale farmers in the tropics have access to these improved varieties. The economic and social effects are also included, as improved varieties mean higher income and more 'wellbeing' to the farmer and his family. And not least, better vegetables mean a healthier, more balanced diet for the whole community. The Plant Science Experience and the special exhibition 'Seedmanship in the tropics' in Sow to Grow can be visited from 1 November 2019 until the end of April 2020 in the former City Orphanage, Westerstraat 111 in Enkhuizen. For opening hours and entrance fees see: www.sowtogrow.nl

Headaches and celebrations

On 1 November, Ursula von der Leyen will take office as President of the European Commission. For the next five years Vice President, Frans Timmermans, will be responsible for the 'European Green Deal', the prevention of climate change. This includes a law that states that Europe will be climate neutral by 2050. Besides climate, he also supervises policy on agriculture, transport, energy, and the environment and oceans. That does not sound too bad. Von der Leyen is known for her ambition to create a European political arena with less bureaucracy and more real policy. And, personally, a team with nearly as many women as men strongly appeals to me. Timmermans is a European in heart and soul, a multi-language speaker and a strong defender of democracy.

There is, however, cause for serious concern. Timmermans has chosen environmentalist Diederik Samson as his head of cabinet. The latter is well-known as campaign leader of Greenpeace, with a reputation as an activist, who boasted proudly to have been arrested ten times. That bodes no good for people working in the agricultural and horticultural sector. While Greenpeace promotes the consumption of plants over meat, it does oppose the use of modern breeding technology and the use of chemical crop protection in no uncertain terms. Hopefully, Euroseeds is able to convince the new Members of Parliament that plant breeding and seed production are pivotal to a reliable food supply.

The other headache is caused by the British, who still do not seem to know what they want. According to the government dossier 'Operation Yellowhammer', the UK could face months of disruption at its ports after a no-deal Brexit. It threatens the UK's food security and will lead to higher prices and empty shelves in the short-term, especially when it comes to vegetables and fruits. But it also hampers the transport of young plants. And a compromise is very far away.

But it is not all headaches that the future has in store for us. It is also time to celebrate. This summer, Kenneth Quinn, president of the World Food Prize, announced that the 2019 Laureate was to be Simon Groot, founder of East-West Seed Company. A well-deserved honour, as he led the transition of millions of subsistence farmers, many of them women, to horticulture entrepreneurs, thereby greatly enhancing their livelihoods and income. The award ceremony will be held on 17 October, the day after UN World Food Day. It emphasises that there are still people who believe that food security is fundamental to freedom and who chose to act upon that conviction. We cannot praise them enough.

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'The time of farm saved vegetable seeds is over'

Monique Krinkels

6 **More than 20 million smallholder farmers and their families in over 60 countries profit from the vision World Food Prize laureate Simon Groot developed 37 years ago. His aim: to breed vegetable plant varieties suitable to local (tropical) circumstances and to produce high quality seeds. The result: a doubling or even tripling of the income of the farmers.**

If you are looking for Simon Groot, you had better go to the Dutch office of East-West Seed Company in Enkhuizen. Although nearly 85 years old, he is still at work. "I cannot help it," he says, "it is in my blood. And there is still so much work to do."

The start

When in 1981 the family owned seed company Sluis & Groot was sold to Sandoz (nowadays Syngenta), Simon Groot left his job as marketing manager to follow his dream: to professionalise the vegetable seed production in South East Asia. At the time, the smallholder farmers depended either on farm saved seeds or on seeds from expired lots coming out of Europe and North America. The latter were varieties that were often not suitable for a tropical climate nor adapted to the local growing practices. The results were deplorable: low yields, variable produce quality

and a rampant spread of plant diseases. Therefore, together with Benito Domingo, he started the East-West Seed Company in the Philippines in 1983. As a Philippine national, Benito Domingo had the necessary local connections to the traditional seed trade, agriculture industry and universities. "We shared the passion for seeds and to emphasize the partnership between an Asian and a European, we named the firm East-West Seed Company," explains Simon Groot. "We started on a small 5-hectare farm just outside Lipa City, in the Province of Batangas

on the Northern island of Luzon in the Philippines. Our first breeding programme was bitter gourd as it is a high-input, high-price crop and thus ripe for hybridisation." Bitter gourd (*Momordica charantia*) is a bitter tasting but nutritious vegetable that is largely unknown in Europe. It is, however, widely used in Asian cuisine.

"We believed that a hybrid variety of this crop would greatly benefit farmers in the surrounding area." He recruited plant breeders from Wageningen University & Research to speed up the developing process. Early 1984, the breeders created a promising cross that produced a vigorous growing vine, high-yielding, with large fruits and tolerant to diseases such as downy mildew. They named this new variety 'Jade Star'. It was the first locally developed commercial vegetable hybrid in all of Southeast Asia. New varieties soon followed of other vegetables, including kangkong, yardlong bean, sweet corn, tropical pumpkin, ridge gourd, wax gourd, cucumber, tomato, watermelon, eggplant, onion and many more.

Systematic support

But the work did not end with breeding new varieties and producing healthy seeds. It took some time to convince the locals to buy the seeds as farmers do not like a leap into the unknown. "They have to see the plants growing on trial fields, watch how the neighbours are faring and try it out on their own plot, before they decide to buy something new." Therefore, Simon developed a system in which the farmers received the much-needed support and education. Trial fields demonstrate the superb quality of the East-West varieties and sample seeds encourage farmers to try it on their own plot.

But to unlock the full potential of the new varieties and maximize the benefits of the high-quality seeds more is needed. Many farmers still used traditional farming methods that were not optimal for insect control, watering, soil nutrients and conservation. He started to run training courses to improve agricultural practices. "The trained farmers passed on the knowledge and skills they gained to their neighbours," says Simon Groot. This training grew to become East-West Seed's Knowledge Transfer programme - the first time a seed company had invested heavily in capacity building for its customers.



East-West Seed Company

Family owned East-West Seed Company is one of the ten largest vegetable seed companies in the world. It has a leading position in the most important Southeast Asian countries and expands rapidly in India, China, Africa and South America. It has 14 R&D stations in six countries. So far, the company has bred 973 hybrids as well as open pollinated varieties of over 60 tropical vegetable crops. The company, with a head office in Bangkok, Thailand, has about 5,500 employees worldwide.

Simon Groot: 'You have to share your knowledge if you want to make the world a better place. That's why I will use the lion's share of the World Food Prize money to strengthen our Knowledge Transfer Foundation. A smaller part will be used to improve the school gardens' policy in the Netherlands, as it is important to enable children to become familiar with vegetables and how they grow'





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'We actively take action against child labour'

The World Food Prize

The World Food Prize is awarded each year to a person or persons who have advanced human development by improving the quality, quantity or availability of food in the world. It emphasizes the importance of a nutritious and sustainable food supply for all people. The World Food Prize was created in 1986 in honour of Dr Norman E. Borlaug, winner of the Nobel Peace Prize in 1970 for his work in global agriculture, resulting in what today is known as the 'Green Revolution'. The prize, nicknamed the Nobel Prize for Food and Agriculture, consists of \$250,000 (€225,000) and a sculpture designed by the famous graphic designer Saul Bass. The award ceremony takes place in the Iowa State Capitol of Des Moines, USA. This year the event is organised on 17 October, the day after UN World Food Day.

Today, 100 staff train more than 56,000 farmers each year in eight countries in Asia and Africa, and aim to reach millions more through other media, such as crop guides translated into the local languages and instructions that are accessible to all education levels. From land preparation and seedling production to fertilizer application, disease management and the safe use of pesticides, everything a farmer needs to know is freely available.

Expansion

East-West Seed Company quickly expanded its activities. In 1984 it opened a subsidiary in Thailand, later subsidiaries or joint ventures were established in Indonesia, India, China, Vietnam, Malaysia, Cambodia, Myanmar in Asia, followed by Tanzania and Guatemala. In addition, they export seeds to the surrounding countries. The seeds of East-West Seed Company are available in 60 countries. The seeds are packaged in small quantities, suitable for farmers who have plots no larger than 1 hectare.

"It took quite some time before you 'have your legs under your body', as the local West Frisian saying goes. After 15 years, we reached the break-even point and another five years before we had our first profit," says Simon Groot. "Our biggest challenge at the moment is Africa. It is an immense continent with generally not very fertile soil. Not much attention has ever been given to preparing the land and the use of fertilizers. Furthermore, the agricultural knowledge level of farmers is lower than in Asia," explains Simon Groot.

NGO's often claim that the use of farmer saved seeds should be promoted in Africa. "That might be true for staple crops, such as maize, but certainly not for vegetables. The seeds might be free, but the yields are unreliable and low compared to hybrids. We sell our seeds for very moderate prices. If a farmer invests € 0,01 in a tomato seed that produces tens of kilos of high-quality tomatoes, his income increases tenfold. If given the choice a smallholder farmer will therefore always choose high quality seeds."

Far reaching consequences

The approach of East-West Seed has had far reaching consequences for farming communities. The improved varieties provide food and income security to 20 million smallholder farmers and their (often large) families. Farmers planting hybrid seeds achieve higher yields and better-quality produce that sells for higher prices. These high-quality, attractive vegetables encourage consumers to buy more of them, thus ensuring a healthier diet for the whole community. The multiplied income levels offer smallholder farmers the opportunity to invest in new income-generating activities. If a family can, for instance, purchase an ox, they can rent it out to other farmers and earn some extra money.

It even changes the future, as farmers are able to send their children to school, making sure they receive a proper education. East-West Seed started a 'Children must go to school' campaign to promote this. "In addition, we have a programme to prevent child labour in seed production. We actively monitor and take action against it. It is included in every seed contract with a bonus and penalty system to emphasize the importance we attach to it."

Celebrating

2019 will be a year of celebrations for Simon Groot. First of all, he will celebrate his 85th birthday in October. This July, the University of the Philippines Los Baños has awarded an honorary doctorate to him. The University of the Philippines (UPLB) granted him the title Doctor of Law, honoris causa, at the opening of the Philippine academic year. "The university is impressed by the remarkable achievements of Groot as the founder of East-West Seed, a company that has significantly contributed to improving the liveli-



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The rain simply wasn't falling and farmer Arun Mohan

Pote was losing money. His land, located in the village of Dhanora, Hingoli District in Maharashtra, India, was focused on cotton, soybean and wheat. Rainfall and access to other water sources in this area is a constant challenge for farmers such as him.

This means that vegetables, especially in the dry season, can fetch significantly higher prices at the market.

But Arun still had no way of watering his crops or how to select which vegetables would grow well under dry conditions. Everything changed when he teamed up with East-West Seed Knowledge Transfer (EWS-KT), which aims to increase the skills of smallholder farmers to allow them to increase their yields and improve their livelihoods. EWS-KT's technical field officer Prakash Lakhade helped Arun learn how to implement drip irrigation on his farm. The two also closely looked into market research and, after much discussion,



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identified the three best crops to grow during winter, namely: bitter gourd, okra, and ridge gourd.

From bitter gourd, Arun saw a 986% return on investment in just one season with a nett profit of over 94,000 rupees - about 1,186 euro - on an area of just 0.2 acres. To put this

into perspective, he previously achieved nett profits of around 6,000 rupees per one acre of cotton and 3,000 for one acre of soybean. Regarding okra and ridge gourd, he received a net profit for both of over 37,000 and an ROI of 436% and 981% respectively. Delighted with the results,

Arun wants to invest some of the profits back into building a large well on his land so that he can grow more during the dry seasons. He remains a 'key farmer' for East-West Seed Knowledge Transfer and shares what he has learned with other farmers in his community.

hood of farmers and the availability of nutritious and affordable vegetables for Filipino consumers," said UPLB President Danilo Concepcion.

But the icing on the cake is of course the World Food Prize. "Mr. Groot has led the transition of millions of subsistence farmers, many of them women, to horticulture entrepreneurs, thereby greatly enhancing their livelihoods and income. These farmers have invigorated both rural and urban markets for vegetable crops in their communities, making nutritious vegetables more widely available and affordable for millions of families each year," said Kenneth M. Quinn, president of the World Food Prize Foundation, at the Laureate Announcement Ceremony on 10 June.

On 17 October, Simon Groot will attend the World Food Prize Laureate Award Ceremony in the magnificent Iowa State Capitol Building in Des Moines, USA. The ceremony rivals that of the Nobel Prize, drawing over 800 people from more than 75 countries. He will be accompanied by three of his four children. "My daughter, Maaike, is responsible for corporate

communications and has handled the media since my nomination. I was quite overwhelmed with the attention I received. Not only from local media, but also from international media. Furthermore, two of my sons, Ard and Rutger, work for East-West Seed and they will surely come to the ceremony. They form the 7th generation of seedsmen in our family." Dr Louise Fresco, president of Wageningen University and Research in the Netherlands, underlined the philosophy of Simon Groot. "Notwithstanding his wide international experience with political leaders throughout the entire world, Simon Groot has remained a modest man. The expression that characterizes him most is: 'Seeing big smiles on faces of farmers has given me tremendous satisfaction.' Those are words that Dr Borlaug himself could have uttered. Both men share an extraordinary vision and dedication. I am convinced that Dr Borlaug would have been impressed by the stamina and vision of Simon Groot and would have shared his conviction that food security must entail not only calories, but also nutritional qualities through vegetables."

Quo vadis, Europe

Garlich von Essen

12

Slowly, only the smoke is clearing following the elections of the European Parliament at the end of May and the subsequent, quite animated, discussions around the nomination of Ursula von der Leyen as designated new Commission President.



With 383 votes in favour, the European Parliament elected Ursula von der Leyen President of the next European Commission. She is set to take office on 1 November 2019 for a five-year term

Garlich von Essen is Secretary General at Euroseeds, Brussels, Belgium, vonessen@euroseeds.eu

Now that the membership of the freshly elected Members of the European Parliament (MEPS) to specific Committees and delegation has been clarified and positions and responsibilities have been assigned to Committee Coordinators, leaders of national delegations and political groups, all over Brussels, in the European capitals, and in companies and associations in the EU and beyond, public affairs and advocacy specialists and communication managers are now trying to understand what it all may mean for them. So, let's look into the crystal ball – and by the time of publication of the predictions in this article, you will be able to assess for yourself whether the author got it partially right or rather partially wrong.

More diverse

In a nutshell, the new European Parliament at first glance looks more diverse, some even say scattered, with more and new political groups. Still, most of the groups, despite new names or abbreviations, are actually the ones we already know well. What is indeed a major shift is that the old centre-right and centre-left cooperation that dominated decision making ever since the first direct election of the EP in 1979, has lost

its absolute majority of votes. At minimum, a third partner is needed, with RENEW EUROPE (the former Liberals) and the GREENS competing for the position of deal-maker. That the sights of both EPP and Socialists are more on Renew Europe than the Greens became pretty clear during the discussions around the nomination of Ursula von der Leyen, where the latter in the end were sidelined and voted down. So, is it not true then that this new parliament is more environmentalist or 'green' than ever before? Well, what has become obvious as well is that more or less All political groups are trying to position themselves as advocates of a greener or more sustainable Europe. That seems to push the Greens to take more radical positions, which in turn limits options for cooperation for both EPP, right-wing Socialists and market Liberals. Finally, with Brexit looming, many predict a power shift from the North-West towards the South-East of the Union and a more powerful France as its

natural leader. Again, caution seems required. While many of the Southern countries (including France) would indeed like to see financial austerity loosened and larger scale state-induced economic initiatives, this clearly is not in line with the views in many Eastern European countries. These have also been antagonised by the French push for stronger integration, which most see as a threat to their new-found independence from foreign (aka Russian) influence. Also, Italy has criticised 'Brussels' for being too influential and on top of that it has had spats with France on numerous issues in the past year or two. So again, it does not seem so clear how the required qualified majorities in Parliament (and council) can be obtained without collaboration and compromise of the well-established political groups and alliances.

Continuity

Similarly, with less detail known at the time of writing, the Commission seems to be going in a direction of continuity rather than fundamental change. Defeated Spitzen Timmermans and Vestager are likely to receive prominent titles and a coordinating function for a set of Directorates (Timmermans is tipped for Climate and Vestager for Digital Change). This again is a concept already established in the Juncker Commission - and which has not been terribly effective there. But, with still 27 (or 28?) Commissioners around, there is still a need for jobs (and grand titles to go with them) for (too) many and Member States also see the individual assignments as payback time for their respective support or opposition for Von der Leyen. So, there will probably be the 'more equal than other' Executive Vice-Presidents Timmermans and Vestager, then a good number of Vices from Eastern Europe and smaller Member States, while the big economic portfolios will go to the true heavyweight countries such as France, Italy, Spain and Poland. Again, that does not look too much like a big change from past administrations.

And let's not forget: there are many other important players that influence the EU's policy agenda and decisions. First and foremost, there is the Council. While there are always changes of government in the one or other Member State that influence the overall composition, the relative strengths of certain party families etc., neither its institutional role nor

Political group	Chair or co-chairs	Members
Group of the European People's Party (EPP)	Manfred Weber (Germany)	182
Group of the Progressive Alliance of Socialists and Democrats in the European Parliament (S&D)	Iratxe García (Spain)	154
Renew Europe group	Dacian Ciolo (Romania)	108
Group of the Greens/European Free Alliance (Greens/EFA)	Ska Keller (Germany) and Philippe Lamberts (Belgium)	74
Identity and Democracy (ID)	Marco Zanni (Italy)	73
European Conservatives and Reformists (ECR)	Ryszard Legutko (Poland) and Raffaele Fitto (Italy)	62
Confederal Group of the European United Left - Nordic Green Left (GUE/NGL)	Manon Aubry (France) and Martin Schirdewan (Germany)	41
Non-attached Members		57

The European Parliament (EP) represents more than half a billion Europeans and currently consists of 750 Members (of which 73 British) plus the President

political self-conception changes with any national election. In its composition as European Council of Heads of Government, it can very much influence the policy agenda of any Commission; and it is a safe bet that it will attempt to do specifically that in the early days of the new Von der Leyen team. European court of Justice, Court of Auditors, the many EU agencies (including the CPVO)... - none of these are directly influenced by the changes in Parliament or Commission. And all of that provides a rather stable political and policy framework to the more or less meandering centre of Parliament and Commission.

New

All in all, will it then be more or less just business as usual and no fresh wind of change blowing through EU institutions? Most likely, a bit of both. While the institutional set-up will be approximately the same and the known key countries and political groups remain the most influential players, the style of policy making (gender balance, mainstreaming, intensified outreach of the COM towards Parliament) is likely to become less confrontational and more cooperative,

Getting to know all new Members is a huge challenge

probably partly also out of sheer need. But the impact of the many new (almost 65% of all MEPs are new in their role!) and younger MEPs in this context should not be neglected. And then there is the important element of individual persons and personalities now assuming new roles, positions and responsibilities in Parliament and Commission. It is not only MEPs and Commissioners, it is also their teams in private offices and Cabinets with individual aspirations, career plans, interests and backgrounds that makes the whole EU machinery work for better or worse. Getting to know all these individuals and understanding their professional needs is clearly the most important (and time consuming) part for public affairs people in industry organisations and NGOs alike. For our agri-food policy area and for an association such as Euroseeds, all this is a huge organisational and administrative challenge. Generally, Brussels' offices consist of a rather small team with limited financial means at their disposal. Analysing hundreds of individuals in the Commission, and rather thousands when it comes to Parliament, puts an enormous strain specifically on our human resources. Intelligence is important; but it does not come fast or cheap. It requires a continuous effort that needs proper preparation and well-planned actions. At Euroseeds, we already started that in mid-2018 with the preparation of a relaunch of our website (www.euroseeds.eu), the integration of our highly successful #EmbracingNature social media campaign, with the change of our name to 'Euroseeds'

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Breeding

Planning

Quality

Reporting

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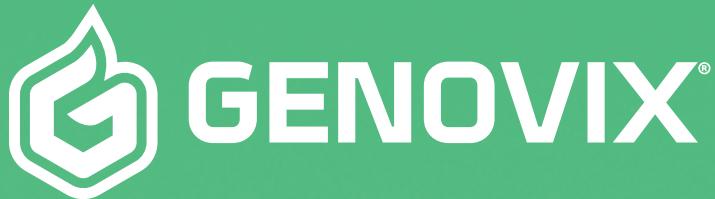
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Quo vadis, Europe



The style of policy making is likely to become more cooperative

coinciding with the elections, and with the planning of specific information and engagement formats that will boost our outreach towards decision makers and influencers at Brussels level. We also had intensive sessions with Members over the summer and plan to further intensify our activities, together with the wider membership, in the coming weeks, months and years.

To me, the opportunities still outweigh the foreseeable difficulties and challenges any political and administrative change of this magnitude poses for a relatively small organisation, such as ours. We have a chance and must try to capitalise on the new openness that comes with any new group of policy makers and make use of the opportunities that now

lie in front of us. We are looking forward to engaging discussions as we truly believe that the seed sector has not only a great story to tell but can also very concretely and effectively demonstrate its contribution to important policy objectives, such as climate change mitigation, environmental AND economic sustainability, health and nutritional values and so much more.

At Euroseeds, we will make sure that the sector's voice is heard by effectively contributing all our experience and expertise to achieve good results for Europe's breeders, seed producers and farmers, as well as our European society at large.

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We share Jose's eagerness to grow and develop

"After studying agronomics in Santiago, I returned to the village where I'd been raised and still felt at home. I started working at Rijk Zwaan, and just two years later I was asked to become Station Manager. It was a tough decision for me because I knew I had to move away from my village. But in the end I went for it, and I'm glad I did. I've been able to strongly develop personally and the combination of working with plants and people is perfect for me. When I look back on my time at Rijk Zwaan, I feel really thankful for the steps that I've been able to take – and I'm still only 31 years old and see so many possibilities ahead of me!"

Jose Marcelo Caro Tobar is Station Manager for Rijk Zwaan in Chile. He seizes the opportunities that come by and thus keeps on developing. Rijk Zwaan – a worldwide player in vegetable breeding – shares this approach. We are working together towards a healthy future. Learn more at rijkzwaan.com

Sharing a healthy future



Loss-of-susceptibility for geminivirus-plant interaction

Marcel Prins

16 **Plant breeders always look for new strategies to fight pests and diseases. Researchers at KeyGene have shown that loss-of-susceptibility can be powerful to combat geminiviruses.**

Geminiviruses cause yield losses in a range of crops worldwide. In addition, geminiviruses are a key factor in the so-called 'zero tolerance' chemical approach to the whitefly. Whiteflies can disseminate the virus so efficiently that only a small number can engender massive virus damage. A team of scientists at KeyGene, the crop innovation company, based in the Netherlands, USA and India, have successfully studied and developed new possibilities to combat these viruses.

New approach

To be able to efficiently grow crops that are now sensitive to geminiviruses (such as sweet and hot pepper, cotton and cassava) in a more sustainable way and achieve good yield stability, breeding varieties with resistance to the virus offers a smart and effective solution. However, very few varieties with

resistance against geminiviruses are available at present for breeding in crops such as sweet pepper. That is why alternative antiviral strategies may offer better prospects.

In a partnership with leading vegetable breeding companies, we studied the possibilities of using the loss-of-susceptibility approach to eliminate geminivirus problems, starting with sweet pepper. This type of insensitivity to virus infections is expected to last longer than the commonly used 'resistance' approach, which tends to be quickly broken by evolutionary changes in the virus.

Plant defence

In classical cases of resistance, plants actively recognize the virus. This recognition is followed by programmed cell death, making it impossible for the virus to reproduce and spread through the plant.



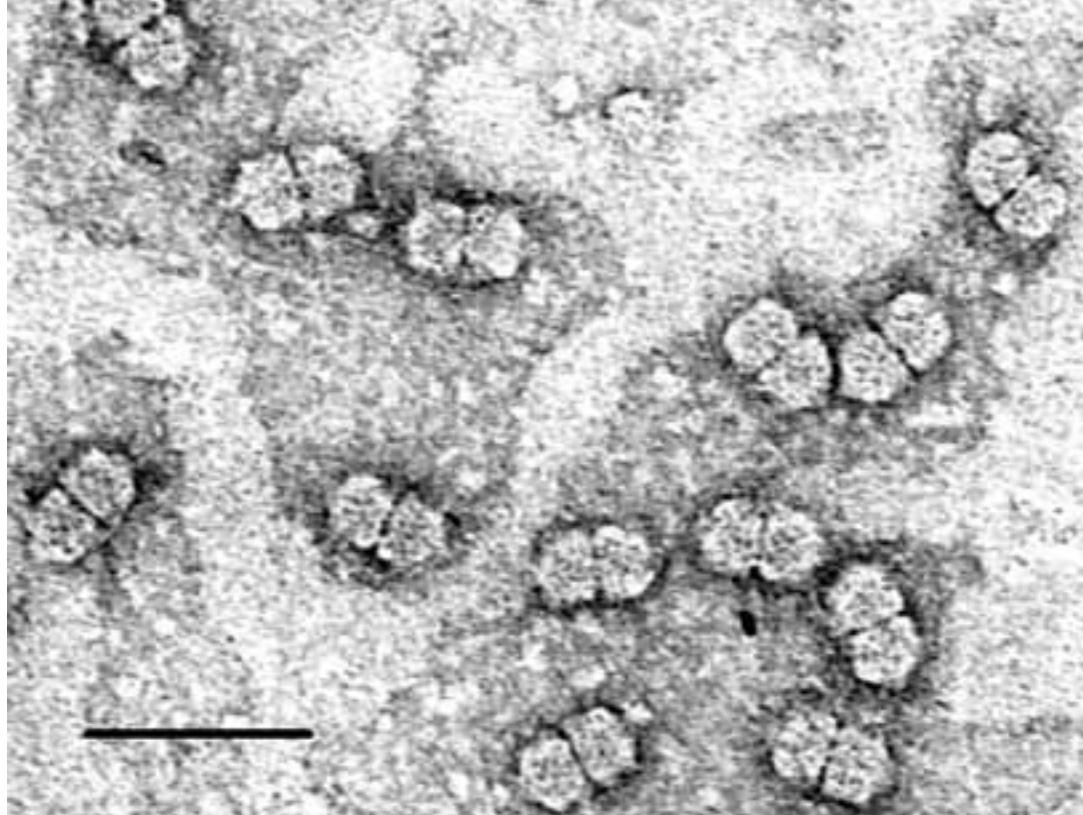
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Geminiviruses form a family of single-stranded DNA viruses that infect plants. It is a virus family that evolves very quickly thanks to DNA recombination and through error-prone replication. The result is that the available resistance sources are quickly broken down in field conditions, leading to new virus epidemics (Photograph Ed Rybicki)



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Companies involved in this research have started using the results in their own breeding programmes

Prof.dr.ir. M.W. Prins is phytopathologist, with a special interest in plant virology at the Faculty of Natural Sciences, Mathematics and Computer Science at the University of Amsterdam and head of the vegetable crops department at KeyGene, Wageningen, the Netherlands, marcel.prins@keygene.com.

no longer be recognized by the plant. The 'new' viral isolate thus breaks through the resistance and plant breeders will need to look for new resistance sources to be introgressed into the crop. Non-susceptible plants (or non-hosts) do not need to defend themselves as the virus is unable to utilize the plant for its replication. Plants that have lost their susceptibility no longer produce proteins that the virus can exploit for infection. It is expected that the chance of evolution and selection resulting in viruses that can infect these plants, is very low. That is why this type of insensitivity to virus is expected to be more durable than the commonly used resistance.

Finding the needle

In cooperation with four leading vegetable breeding companies, Rijk Zwaan, Enza Zaden, Limagrain Vegetable Seeds and Takii, we studied sweet pepper plants with induced changes in the so-called dTP-gene, a gene required for successful virus infection. To generate these changes, we screened mutation

Viruses can relatively easily circumvent this defence. Spontaneous mutations and existing natural variation may lead to virus variants that can

populations based on chemical mutagenesis. This led us to discover and select plants that were no longer susceptible to geminiviruses, while at the same time having no changes in other plant characteristics. The breeding companies that were involved in this research have already started using the results in their own sweet and hot pepper breeding programmes. "Our companies foresee that this new approach may help in finding a powerful solution to the threat of geminiviruses," comments Arnaud Messager, Scientific Director at Limagrain Vegetable Seeds.

Cotton, cassava and other crops

Geminiviruses also cause problems in crops such as cotton and cassava. We therefore studied if the same principle could be applied to crops other than pepper. Genetic analysis of the cotton and cassava pinpointed the dTP-genes of these crops. *Arabidopsis* plants were raised having the altered dTP gene. When complementing geminivirus-resistant *Arabidopsis* plants with dTP genes of cassava and cotton, plants became susceptible to geminiviruses. This 'restored' susceptibility demonstrates the generic function throughout geminivirus susceptible plants. Moreover, it indicates that the loss-of-susceptibility concept may be broadly successful in reducing the use of chemical products to combat whitefly and in securing yields of crops that are now sensitive to geminiviruses.

European Union invests in variety testing

Breeding companies are working hard to provide new varieties that are more resilient, that can withstand adverse weather conditions and need less input, have better resistance against diseases and will still produce good quality products. To achieve these goals, the variety testing system has to be adapted.

Kees van Ettekoven

As in the rest of the world, European farmers are faced with major challenges; climate change leading to periods of drought and flooding, pressure to use less crop protective chemicals and fertilizers, and an increasing demand for food due to the growing world population. New plant varieties should help farmers to cope with these changes.

A limiting factor

In order to bring the new expected varieties to the market, the existing system of variety testing could become an obstacle. Before entering the market in Europe, varieties have to be tested to see if they are distinct from already existing varieties, Uniform and Stable (DUS criteria and tests). Agricultural varieties further have to pass the so-called VCU (Value for Culture and Use) tests.

In the DUS test, morphological characteristics are observed and described that (up till now) do not allow the use of characteristics such as drought resistance or less dependency on fertilizers. Whereas the DUS test is carried out in one of the EU member states, leading to access to the whole EU, VCU tests are carried out on a national level. Also, in these tests it is expected that it will be difficult to evaluate some of the new traits. The use of molecular techniques in Variety Testing is still in its infancy and needs major investment to increase its importance.

CPVO and Horizon 2020

Variety testing is carried out by national Examination Offices that work together in the EU for Plant Breeders' Rights in the Community Plant Variety Office (CPVO). In this framework, the needs for future efficient variety testing were discussed, resulting in a joint effort under the Horizon 2020 research and innovation umbrella of the EU. This resulted in a project proposal: INnovations in plant Variety Testing

Ing. C. van Ettekoven is former head of the Naktuinbouw Variety Testing Department, Roelofarendsveen, the Netherlands, and member of the Executive Committee of INVITE.

This project has received funding from the European Union's Horizon 2020 research and innovation programme, under grant agreement No 817970.

in Europe (INVITE) to foster the introduction of new plant varieties better adapted to varying biotic and abiotic conditions and to lead to more sustainable crop management practices.

General objectives

INVITE aims to improve both efficiency of variety testing and the information available to stakeholders on variety performance under a range of production conditions and biotic and abiotic stresses. This will be achieved by:

- the identification of bio-indicators that can be used to describe the varieties and their attributes;
- the introduction of new phenotyping and genotyping tools;
- the development of prediction models and statistical tools;
- improvement of test protocols;
- development of cooperation models in variety testing;
- setting up of database principles for the storage of molecular variety data;
- dissemination of the results;
- proposals for decision makers.

When the dust of the Horizon 2020 procedure had settled, INVITE appeared to be accepted and a grant of 8 Million Euro was allocated for a five-year project that started in July 2019 and will end on 30 June 2024. For the implementation of INVITE, a consortium of 29 partners from 13 EU countries was formed. Among the partners, there are research organisations such as INRA, Agroscope (FR), WUR (NL), Universität Hohenheim (DE), Examination Offices from Germany, Italy, Hungary, France, Belgium, Czech Republic, the Netherlands and CPVO. The organic sector is represented by FiBL and also through Euroseeds, the European Breeders are participating as partners. Focussing on seven main species (maize, wheat,



The use of molecular techniques in Variety Testing needs major investment to increase its importance

Researchers and Examination Offices can learn a lot from each other

sunflower, ryegrass, apple, tomato and potato), the various sub-projects will be developed and three more application species (soybean, lucerne and oilseed rape) will be used to further test the developed tools and methods.

INRA is responsible for the management of INVITE.

Working groups

In INVITE, nine working groups were created dealing with the following subjects:

Working group one will try to identify new characteristics linked to water use efficiency, tolerance to challenging environments, resistance to biotic stress and indicators for crop resilience.

Working group two will introduce mobile high-throughput phenotyping tools, aimed at low cost image acquisition, select cost effective phenotypic sensors for DUS trials, use colour imaging for VCU trials.

Working group three will develop genotyping tools to better characterise varieties and their performance.

Working group four will deal with the development of predictive models for variety performance.

Working group five will test the developed tools in the groups two, three and four in field trials.

Working group six will develop improved variety testing networks.

Working group seven is the database group that will create a safe environment to store the project data, but will also work on the development of a European DUS/VCU and genetic data database prototype.

Working group eight is responsible for the dissemination of the results of the project through publication, but also by organising field days, workshops and meetings. This group will also formulate the consequences of the project on EU legislation.

Working group nine is responsible for the management of the whole project.

Expected impact

It was already clear during the kickoff meeting in July that researchers and Examination Offices can learn a lot from each other. If we succeed in implementing a number of tools developed for phenotyping and genotyping, this can be a great help in making variety testing (DUS and VCU) more efficient.

Development of genotypic tools and modelling in VCU may lead to a different approach to VCU testing, with a more centralized test for a number of characteristics and traits using genotypic and phenotypic tools. This, combined with predictive models, will result in much smaller national trials for the remaining characteristics (e.g. yield).

Together with INVITE, another project proposal was accepted in the Horizon programme: Innovar. It has more or less the same objectives as INVITE, but will deal specifically with wheat and will create a huge database with molecular information of the existing wheat varieties. Innovar will start in October 2019 and cooperation between INVITE and Innovar has already initiated.

Stakeholder involvement

The result of INVITE is meant to be beneficial for European agriculture. This means that INVITE will cooperate with farmers, breeders, researchers and also authorities during the project. Stakeholders will be invited to participate in annual meetings to share results and discuss progress.

8 million Euro is a large sum of money, but it has to be divided over 5 years and 29 partners and, as is clear from the description, the ambition is much larger. INVITE hopes to be able to work with historical data to avoid extensive trials having to be carried out to collect data at the start of the project. Euroseeds will work with its members to ensure that these data can be used in the project.

Commercial pollinators more popular than ever

Daphne Hoogeveen

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The world's natural pollinators are dwindling in numbers at an alarming rate. Anticipating the need for safe and efficient commercial pollinators, leading biological solutions innovator, Koppert Biological Systems, has been breeding a range of commercial pollinators since 1989 and has achieved global recognition for its sustainable solutions in this field.



The green bottle fly (*Lucilia sericata*) is used for pollinating small-scale, isolated crops

Daphne Hoogeveen is communication specialist at Koppert Biological Systems, Berkel and Rodenrijs, the Netherlands, DHoogeveen@koppert.nl.

• **Through their high pollen transfer**, frequent flower visits and long working days, bumblebees have proved to be very reliable pollinators. Their commercial introduction into greenhouses in the 1990s had a huge impact on horticulture, improving fruit set and quality and increasing yields by an average of 30%. In certain crops, such as tomatoes, it has led to a significant reduction in the use of pesticides, promoting the use of (other) beneficial insects and boosting food safety. Supermarkets and consumers now recognize the benefits of sustainably grown food and the demand for fruit and vegetables that are free of chemical residues continues to grow.

Innovative solutions

The decline in the number of wild pollinators, the impact of climate change, and rapidly increasing demand for safe and secure food supplies, have led to a growing need for commercial pollinators over the last two decades. Consequently, both the quality and reliable availability of commercial pollinators have become increasingly crucial; as has the need for more tailored pollination solutions in which well researched and tested combinations with other pollinators have proved to be an added value.

“Creating innovative solutions in cooperation with customers and nature itself is one of Koppert’s biggest ‘assets’. This is certainly the case in our dealings with seed companies,” says Koppert’s Natupol Product Manager, Remco Huvermann. “Our experience in this field and feedback from our consultants and growers themselves have led us to appraise each customer’s situation to come up with tailored solutions that, in some cases, combine a number of different pollinators such as male bumblebees, flies and honeybees, for example.”

Koppert’s involvement with seed companies goes back to 1993 when it started to research the special needs of seed breeders. “We were the first to use bumblebee males as pollinators and soon started researching the added benefits of using pollinating flies,” Huvermann recalls. “Today, we can offer a whole pollination package to optimize pollination solutions for seed breeders, providing the perfect tools – from small cages or isolation tents, to large open field applications.”



Natupol booster is a huge bumblebee colony used for pollinating open field crops with a short flowering period



Each nest box of natupol seeds contains a small bumblebee colony consisting of ten workers and male brood

Bumblebees?

“It’s worth noting that there are no ‘bad’ pollinators. Every pollinator has its own unique qualities. It’s up to crop specialists to define which pollinator or mix of pollinators is the best for a specific application,” Huvermann explains. “Bumblebee colonies are known to be smaller than, for instance, honeybee colonies. On the other hand, bumblebees make contact with greater amounts of pollen per flower visit, since they are bigger and have thicker ‘fur’. Bumblebees also show a very high visiting frequency and tend to switch often between various parental lines. These aspects add quite some value for seed companies,” Huvermann assures.

“Steering the visiting behaviour is another valuable tool. By closing access to sugar water in the colony,



The bumblebee (*Bombus terrestris*) is a pollinator with unique qualities

bumblebees can be encouraged to work even harder in crops that produce a lot of nectar, such as cucurbits, for example. In some applications, you can also decide to close off sugar water and add a small honeybee colony. Honeybees remove the nectar, stimulating the bumblebees to enhance their cross-pollination behaviour."

Tailored pollination product portfolio

"Individual pollination product portfolios are ideal for seed breeders. For small isolations, we offer two pollination solutions; one based on the fly, *Lucilia sericata* (contained in Natupol Fly), and the other on a unique bumblebee colony (contained in Natupol Seeds). This is a small micro-colony with about ten worker bumblebees which produces only males. Two to four of the workers can be found in the crop pollinating and collecting pollen to feed the brood of the micro-colony. The males which will show up after the first week (and the weeks after) are known to be very effective pollinators. The pollen collected on their fur will stay fully available for pollination," Huvermann explains. The Natupol Seeds colony provides pollination for no less than four weeks and can be used in both indoor and outdoor applications.

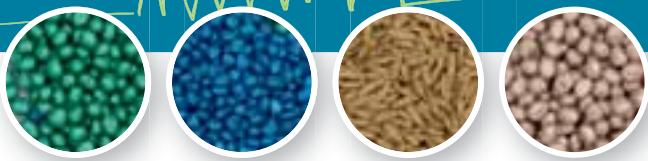
"A growing number of seed companies are now using bumblebees for their outdoor and hybrid seed production. For these applications, we provide three or four large colonies in weatherproof housing. Further-

more, we also carry another unique product, namely Natupol Booster. This is a huge bumblebee colony with very high activity from the start that lasts for at least four weeks. It has extra ventilation and sugar water for about ten days. An ideal product for short blossoming crops or hotter environments, and crops which produce a lot of nectar," says Huvermann.

The highest availability

Koppert Biological Systems produces bumblebee colonies in quarantined facilities conforming to inter(national) legislation and carries veterinary certificates. Koppert has four strategically located breeding centres and is able to produce bumblebee colonies all year round. "It's good to know that it takes twelve weeks to produce a large bumblebee colony. Availability depends on region. This is why planning and good communication with customers is essential so that ordering, transportation and delivery of these live organisms runs smoothly, so that they reach their destination ready to do their job effectively in the crop," Huvermann concludes. Consistent quality and availability ensure that more than a million bumblebees bred by Koppert are released into a growing variety of crops every year.

Interested in finding out more? See: www.koppert.com/pollination-products



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Garden Plants, Cut flowers and Pot plants

Resistance breeding in ornamentals becomes a hot topic

John van Ruiten

- In many countries, retailers, marketing organisations and consumers are becoming more critical about the use of pesticides, not only in edible products, but also in ornamentals. Both garden plants, cut flowers and pot plants should be meeting these new demands.

For marketing by retailers themselves, or in certification programmes like MPS, Planet Proof or Global Gap, it is required that residues in garden plants, cut flowers and pot plants must be below certain limits or must not be present at all before these ornamentals can be sold with this label. It is to be expected that the marketing demands are going to be even stricter in the coming years.

Considering the susceptibility of many plant species to diseases and pests, one of the most important topics in the next decade will be to create production systems in which the use of chemical pesticides can be reduced towards zero. Protected cultivation, use of absolutely disease-free propagating material, alternative crop protection techniques, biological control and organic production are directions that can provide answers. But most of all: the aim is that breeders can introduce varieties that are less susceptible to, or even resistant against, the most relevant pathogens or pests. Ornamental plant breeders still have a long way to go (when compared to vegetable crop breeders).

Call for action

In various ornamental crops, resistance breeding has been one of the breeding goals for a long time. Notably in carnations, resistance against Fusarium and Phialophora has already been bred into varieties since the 1980s. Chrysanthemum breeders have introduced white rust resistant varieties in the last 15 years. And rose breeders have been successful in creating garden rose varieties that are much stronger against (powdery) mildew. Recently, sunflower varieties that are resistant against Helminthosporium (false mildew) have been introduced to the market. And many other examples can be given to illustrate that steps forward are being made.

Nevertheless, various organisations and breeders in the Netherlands have called for action. It is of the utmost importance that concerted action and active collaboration is sought to meet the challenge of creating an assortment in the next ten years for growers

eeding opic

The goal of the Centre for Disease Resistance Bioassays in ornamental crops is to help breeders to create an assortment in the next ten years that does not need the use of pesticides



and consumers, without having to use pesticides. Obtaining resistance in gene pools, identifying strains/ isolates of pathogens present in growing centres in the world, developing rapid (DNA based) screening techniques, making practical tests for measuring resistance under field conditions are some of the crucial elements required for resistance breeding programmes.

Next level

Royal van Zanten, Dümmen Orange, Keygene, Plantum, Naktuinbouw, Rabobank, Wageningen University and Amsterdam Green Campus formed the Board of Support Next level Ornamental Breeding. They organized a meeting in October 2018 in Roelofarendsveen, the Netherlands, where the ornamental crop breeding companies were asked to support a concerted action towards developing more resistant varieties. More than 60 companies that were present supported this proposal. As a pilot study, a POP3 supported project was started in 2019 to connect groups of breeders with expert researchers and testing institutes to develop hands-on tools for resistance breeding. This pilot study has generated enough momentum and insight in the important practical issues of bioassays to monitor resistance in breeding programmes that the Board of Support is proposing to launch a broader initiative.

On 26 September 2019, the Board of Support presented their plans to work towards a (virtual) Centre for Disease Resistance Bioassays in ornamental crops. The core of this proposal is formed

by 'knowledge exchange meetings' where breeders and experts will exchange information with regard to desired bioassays that are needed to allow for a successful resistance breeding programme. These meetings should result in project groups that either focus on a specific crop or on a specific pathogen/pest that affects many crops. Importantly, projects will focus on the questions that companies bring to the meeting. Company expertise, their plant materials, representative pathogen/pest strains and the support of experts from research and application institutes should result in robust bioassays that can be used to select more resilient varieties. If more research is needed, funding strategies will be investigated in the course of the programme.

Network creation

The Board of Support asks companies to bring in expertise, plant material and to furnish money for organizing the initiative in the start-up phase and in return companies receive knowledge, network creation and, in the end, solid bioassays for their own breeding purposes. In the groups of participants that will be actually created and during consecutive knowledge meetings, it will be decided which crops/ pathogens will be the first in line to start projects that will form the basis of a long-term (virtual) Centre for Disease Resistance Bioassays in ornamental crops.

More information: Roos van Maanen, project manager of Amsterdam Green Campus (r.vanmaanen@uva.nl).

Exterior of seeds gives away genetic make-up

Monique Krinkels

24 Curiosity, amazement, critical, the looks on the faces of the onlookers mirrors the novelty of the new device presented at the Seed-X booth during the ISF World Seed Congress in Nice. A well plate filled with tomato seeds goes into the GeNee and, within a few minutes, the machine distinguishes which seeds will produce yellow cherry tomatoes and which red ones.

“The GeNee is the first seed phenotype analysis system. It offers accurate real-time classification of a wide range of genetic traits in vegetable seeds and grains – with zero seed destruction,” explains Sarel Ashkenazy, Seed-X founder and CEO. “We are part of a group of companies which specializes in computer vision and artificial intelligence technologies. One of the companies is FDNA, which specializes in facial recognition and the correlation to human genetics. About two years ago, when trying to find new applications for the same technologies, we had the idea to try to establish a correlation between the seed ‘face’ and its genetics. After a few proof of concept experiments, we noticed that by developing customized algorithms, we can find the relationship between phenotype and genotype.”

The agricultural market is new to Sarel Ashkenazy. Until three years ago, he served as executive vice president at Kornit Digital Ltd, a company that is involved in digital printing technologies. As one of the pioneers, Mr. Ashkenazy led business development and sales from \$0 to over \$100 million. Before that, he was active in the Israeli Start-Up arena.

How does GeNee work?

“Our technology is based on a combination of computer vision, artificial intelligence and proprietary algorithms which analyse the seed’s phenotype to detect genetic characteristics or traits on the seed level. We use different types of light wave lengths to capture the data. But it is the algorithms that form the heart of the system. That makes it possible to successfully classify between different varieties and lines by biotic

traits (such as viruses, nematodes and fungus resistance) and quality traits with no genomic markers, either sourced by single gene, or multi-gene (fruit colour, fruit shape, plant structure, pH and more). The breakthrough is that this approach is non-destructive to seeds and allows genotype analysis without doing any molecular genetics tests.”

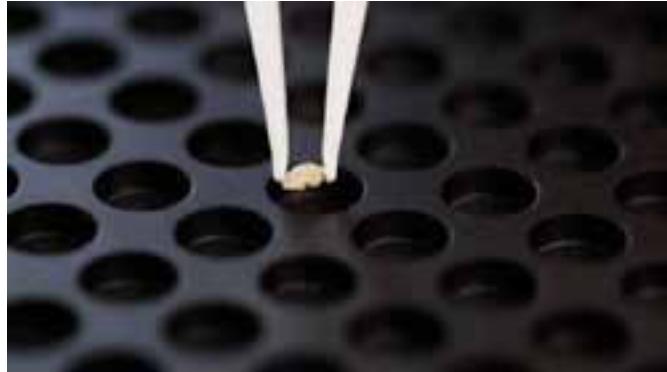
What are the practical benefits?

“The first product we launched is called the GeNee, a portable seed analysis tool that helps plant breeders perform the selection process for every breeding cycle with greater efficiency. The main benefits are shortening breeding time and





'Seed-X is an AI-driven company that is revolutionizing seed quality and safety across the entire seed and grain value chain, for the benefit of seed breeders and producers to giant food companies,' says Sarel Ashkenazy



GeNee's seed-by-seed examinations provide genotypic insights from seed phenotype analysis

25

increasing the probability of success. Conventional seed selection is very wasteful and hit and miss. Our technology supports the agricultural ecosystem by enabling breeders to achieve better results, faster and more sustainably. They can achieve the traits they desire at a fraction of the cost, while significantly reducing use of agricultural inputs – land, water, fertilizers, energy and chemicals. Seed producers can use GeNee to check the quality of samples. The results of the GeNee analysis tool are available on the Web Platform, which features charts, graphs and plots, delivering comprehensive insights about each individual seed/grain and revealing correlations between the seed phenotype and genotype."

How do people react to the GeNee?

"Most people working in plant genetics do not really believe that we can 'see' plant genetics on the seed level. So, naturally, we have to tackle this scepticism barrier, and we are doing this by conducting POC (proof of concept) experiments to demonstrate that it really works. Not only for the colour of cherry tomatoes, but also for classifying hybrids, or detection of traits such as virus resistances. Most breeders and genetics experts cannot imagine that we can detect these traits without any molecular testing or PCR. It's challenging to convince them that it is doable, but once they see the successful POC on their genetic material, this scepticism disappears."

Which crops can the GeNee handle?

"So far, up to 250 varieties of vegetable crops and grains are included in our data base. But it can be expanded very quickly. In order to adapt the algorithm for a new specific task – whether a trait or a different variety – it takes about four hours of imaging and six hours of training the algorithm. Of course, for each task you have to train the algorithm only once. After that you can use it forever, at least if it is based on the same genetic materials. The more users

we have, the faster it goes as the algorithm improves itself: it is a learning machine!"

How reliable is the outcome?

"The seed industry cannot compromise on the results. Developing the precision and capabilities of our algorithms was a challenge at first. In order to train any AI algorithm, and specifically the deep learning which we use, you need to have large data sets for the training. Currently, after two years of operation and more than 150 experiments with different companies and academic institutes, in most of the crops, we no longer face this challenge."

What is the next step?

"The first product that we have is small-scale, mostly for breeding applications and for sampling check for seed quality. Our product pipeline features sorting machines for seed production that will enable sorting by genetic purity, germination probability and health parameters. Today, we are developing two types of sorting machines, a medium-speed sorting machine for vegetable seeds and a high-speed sorting machine for field crops. Of course, in both we are running the algorithm on each seed individually. These machines will serve both the seed industry for quality assessment in seed production and the food industry by identifying defects, disease contaminated grains and combat fraud by protecting IP consistency of grains."

What does Seed-X mean for the future of the seed industry?

"Making a big change in processes and changing lots of old methods – if you can sort out bad seeds from a batch, not only can you enhance every batch, the industry will not have to compromise anymore on quality, no more 90% germination as acceptable or 98% purity – all batches sold will be 100%. Moreover, we believe that, once we have the capabilities to enhance every batch, the seed production methods will change and will be less labour-intensive than they are today."

In the near future, Seed-X aims to utilise its vast crop knowledge base to create the world's largest phenotype-genotype correlations database, thus opening the way for quicker discovery and design of better breeds and maximizing yield/higher productivity, using even fewer resources."





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Biodiversity goals hampering seed production

Daniël Ende

Some field margin and roadside flowering mixtures used to enrich biodiversity contain species that can cross-pollinate with commercial seed productions. This poses a risk for seed production and makes finding suitable fields for seed production more difficult.



Biodiversity has climbed to the top of the international policy agenda in recent years; a recent example being the 'IPBES' 2019 global assessment report on biodiversity and ecosystem services¹. In various countries this has led to a review of existing policies and the formulation of new ones, including policies that want to merge agriculture and biodiversity.

Good intentions

In the Netherlands, where 'undisturbed nature' is scarce, one of the measures to promote biodiversity that is gaining popularity is the promotion of flower mixtures in field margins or strips in cropped fields.

Such diversity would invite natural enemies of crop pests and provide a year-round source of food for birds, bees and other species. This is as part of, or in addition to, the EU-required land that farmers have to use as ecological focus areas, where farmers often choose to sow mixtures of species that reduce nematode populations, such as black oat and white mustard. In addition, flowering species enrich the landscape for passers-by. Even road authorities and local communities sow flowering mixtures on roadsides.

All this sprouts from good intentions, but policies have not explicitly taken seed production into account. Especially for cross-fertilizing crops, significant isolation distances are required with other crops or wild relatives that could cross with the seed crop, especially when overlap of flowering time cannot be avoided. This means that in those flowering biodiversity-rich strips, seed producers need to avoid several cruciferous plants to protect their cabbage, oilseed rape and radish seed production fields. For example, for mustard there are isolation distances up to 400 metres and rapeseed up to 500 metres for hybrid varieties.

Awareness

It is essential in seed production areas that such field margins and roadsides are sown with mixtures of flowering species that do not create any risk of cross-pollination to the seed crops. Primarily, it is the responsibility of the seed producer to find production fields that respect minimum isolation distances. However, flower seed producers and traders that sell field margin and roadside mixtures need to be aware of the interests of their colleague seed producers and check which species they mix. This way, finding suitable fields for seed production will not get more complicated than it already is.

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¹ See: <https://www.ipbes.net/news/ipbes-global-assessment-preview>

Let's tackle this together

Monique Krinkels

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When the relatively new Tomato Brown Rugose Fruit Virus started threatening tomato and pepper production, the participants in ISHI-veg were swift to react. This spring they introduced a test to detect TOBRFV in seeds. Thanks to the virus disaster that struck Almeria, Spain, in 1991, everyone is prepared to set competition aside and tackle the problem together.

Gerard Meijerink remembers the outbreak of Pepper Mild Mottle Virus in the Spanish province of Almeria vividly. At the time, he was quality manager at Sluis & Groot, today part of Syngenta. The autumn of 1991 is engraved in his memory. All of a sudden, plants of the varieties 'Orobelle' and 'Elisa' in that region started to suffer from the tobamovirus PMMOV. An epidemic raged across the countryside. No less than 400 growers saw their livelihood threatened, as plants dwindled and produced fruits that were small and deformed. And while PMMOV has been present in Spain since 1982, is notoriously contagious, can spread quickly from plant to plant through normal cultivation work and can survive for months in leaves, stems, clothes, greenhouse stands and soil, it is also a seedborne disease.

"The Spanish growers strongly believed the seeds to be the culprit," says Gerard Meijerink. A veritable witch hunt began, all directed at Sluis & Groot.

"Demonstrations by growers, accusations in the local press and the Spanish government announcing it would prepare a law according to which every batch of

planting material should be tested for the virus, with zero tolerance as the new standard. Some journalists even suggested that Dutch seed companies deliberately supplied infected seed to protect the Dutch pepper growers from its competitors in Almeria. The Spanish horticultural trade union, UAGAL, also took a stand in the 'affair'. They estimated the economic damage to amount to 110 million Dutch guilders (nearly 50 million euro), which in their view should be fully reimbursed by Sluis & Groot."

Virus/no virus

As quality manager, Gerard Meijerink took immediate action. Early November, the usual complaints procedure started. Sluis & Groot checked whether the batches had been properly disinfected in 10% trisodium phosphate for two hours and the lab technicians tested the seeds that were still in stock. "There appeared to be nothing wrong," he explains. "To exclude any risk, the Spanish branch sent samples of the suspect batches to Enkhuizen. No virus could be detected with the bio-assay method in this seed either."

In Spain, on the other hand, researchers concluded that the seeds were to blame for the outbreak. In December, UAGAL sent seed samples to, among others, the University of Valencia, which came up with a downright destructive preliminary report. Extensive ELISA tests had proven the presence of PMMOV. Moreover, the virus particles were even visible on electron microscopy images.

Deadlock

The situation became deadlocked, as both Sluis & Groot and the Spanish growers firmly believed they were right. That is when Sluis & Groot turned to the NAKG (nowadays part of Naktuinbouw) for help. "The head of inspection and analysis was on the plane within a few days. As an independent institute, the NAKG had to see for itself what was going on," says Nico Koomen, the former director of NAKG. "He visited growers and cooperatives to get a good sense of the situation. It was not possible to assess whether it was a regional problem, whether something was wrong with the variety or whether there were contaminated seed lots. There were fields where nothing was wrong, as well as fields

NAL today

The number of Naktuinbouw Authorized Laboratories has in the last 25 years grown steadily to 20 (despite the mergers in the seed world). The last six authorizations

are in relation to laboratories abroad. All NAL participants together cover more than 75 % of the global trade movements in vegetable seeds. The results of NAL testing are accepted in many phytosanitary programmes worldwide. For instance, for Australia NAL developed a NAL-Department Of Agriculture And Water Resources (DAWR) protocol. After implementation, NAL-participants can ship their seeds to Australia, without the need to sample and test the seeds at the point of entry. The USDA/APHIS-NSHS recognize the auditing results. Harmonization in protocol review,

proficiency testing and field inspection are topics discussed at the moment. When companies are participating in another scheme as well (like ISO 9001, ISO 17025, NSHS and ISTA), NAL reduces its efforts in terms of audit duration, paying respect to what has been covered already by their colleagues. What is important, is that it must be demonstrable that processes are controlled and the Deming-circle is applied.





Almeria today

The Spanish province Almeria is thriving. According to an analysis of the 2017-2018 fruit and vegetable campaign carried out by the Agrifood Studies Service of Cajamar Caja Rural, exports accounted for 80.1% of the total fruit and vegetable production, which included tomatoes, peppers, cucumbers, zucchini, eggplant, green beans, lettuce, melon and watermelons. In terms of volume: some 2.6 million tonnes have been sold in foreign markets. Germany, France, the UK, the Netherlands, Poland and Italy were the main destinations. These exports were worth 2,400 million euro.

with a yield reduction ranging between 30-80%.” Sharing information played a crucial role in the NAKG’s strategy. “Spaniards were brought to the Netherlands, so that they could see with their own eyes how things were done here. In total, three groups, one of journalists and two of technical advisers, visited our country. They took a look at the seed company, the NAKG and at a number of growers in the Westland, the main Dutch glasshouse region.”

New investigation

Sluis & Groot responded with a new investigation. Under supervision of the inspection service, NAKG, three thousand plants were grown to see if the virus might manifest itself a later stage, although that is highly unusual with this virus. At the beginning of January 1992, the plants were six weeks old. Around that time, a possible virus attack should be visible, but again, there was no abnormality to be found. A bio-assay of leaf tissue of the three thousand plants confirmed the observations.

To make the results more comparable with Valencia, Sluis & Groot even imported the same brand of

antiserum as that used in Valencia. “All plants were also visually assessed. No active virus was found up to and including the fruit stage,” says Meijerink.

All in all, Sluis & Groot and the NAKG tested a total of 20,000 seeds and not a single trace of active virus was found.

“But it took the court 12 years to finally decide that the infection with PMMOV was indeed not caused by the seeds.”

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Uniform tests

The lack of a globally uniform testing method was felt here. The Spanish researchers had not taken into account that neither ELISA nor electron microscopy images distinguish between active infectious and inactivated (‘dead’) virus material. The Dutch seed was treated with trisodium phosphate, which inactivates the virus, but does not remove the inactivated virus particles. Meijerink: “The result of the test taken at the University of Valencia was published by

the Spanish press and it took weeks before it became known that the test methods were unsuitable.” That was the moment Sluis & Groot director, Marius Prins, went to the vegetable seed association NTZ (today part of Plantum). “This time it was Sluis & Groot who came under fire, but it could have been any other seed company,” according to Meijerink. “We decided that the knowledge our companies had on seed testing should be shared,” says Frans Plevier, at the time director of Bejo. In the meantime, the NAKG had already started setting up a uniform test method, based upon the information provided by seed companies on in-house testing methods. In order to save time, the NTZ was called in, which subsequently set up an assessment working group. Within two months, the NAKG was able to submit a protocol that was implemented by all Dutch companies with immediate effect. It was the first time that such a harmonized test had been developed for a non-quarantine disease. Frans Plevier: “It was not easy for the plant pathologists and quality managers to be open about the testing methods used in their laboratories. At first, they regarded their colleagues rather as competitors.

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ISHI-Veg today

ISHI-Veg today counts around 60-65 researchers and scientists from 32 seed companies and service labs in 12 countries. They represent 70-75% of vegetable seed that



is traded internationally. A core principle underpinning the success of the initiative is recognition in the vegetable industry that the development of seed health testing methods is a non-competitive subject. ISHI-Veg has published 28 protocols covering 11 vegetable crops on its website and many more are in the pipeline, see: <https://www.worldseed.org/our-work/phytosanitary-matters/>

The benefits to companies and labs from working collectively in ISHI-Veg are:

- speed in development of methods due to collective generation of data and participation in the validation of collaborator-generated methods;
- an increased confidence in new methods due to having access to the natural variation in pathogen strains;
- demonstrated robustness of the methods and recognition of their being industry standards by the industry, accreditation bodies and government entities.

Group, a Technical Coordination Group and International Technical Groups. And it became clear that it was an enormous task to share knowledge on seed testing. The 20 participating companies produced seeds of over 60 different vegetable species for which more than 200 different seedborne pathogens could be identified. It was necessary to focus and agree on a limited number of species and pathogens to work on.”

The importance of ISHI was demonstrated in the next few years. Outbreaks of watermelon fruit blotch in the southern states of the USA and *Clavibacter michiganensis* in glasshouse tomatoes led to huge financial claims, which could be refuted only by the results of validated test methods.

NAKG supported the endeavour wholeheartedly. “Firstly, by starting NAL,” says Nico Koomen. “It ensured that the laboratories of seed companies offer and maintain the required levels of reliability and use validated test methods. And, since a laboratory is as good as its employees, we also developed a course seed analyst. In the nineties, the knowledge of seed transmission of viruses was limited. Most attention was focussed on bacterial and fungal diseases. But we wanted to make sure

ISHI-veg has become a forum for exchanging information

It took quite some convincing that they should share their knowledge.”

ISHI

Soon foreign firms joined the effort. Japanese, French, Israeli and USA-based companies shared their knowledge of seed testing. “It was the birth of a new organisation,” says Gerard Meijerink. “In 1994, we started to formalise it under the name International Seed Health Initiative by establishing a Policy Coordination

that the laboratories also had a profound knowledge of seedborne viruses.”

In 1996 already a small group of representatives of ISTA’s Plant Disease Committee (PDC) and ISHI met to discuss topics, such as whether ISHI’s protocol for comparative testing would be accepted as a standard way of working for ISHI and ISTA, should the planning of comparative tests be integrated. A Joint ISTA/ISHI Guide for comparative testing of methods for detection of seed-borne pathogens was developed that not only included technical procedures but also the mutual consultation on priorities. In 2002 ISHI-Veg’s methods for detecting *Alternaria dauci* and *A. radicina* in carrot seed became ISTA Rules 7-001b and 7-002b, respectively. Today, there are around a dozen ISHI-Veg methods that have been adopted as ISTA Rules.

Even as the ISHI-Veg technical group initially functioned independently, the Policy Coordination Group maintained links with the International Seed Federation (ISF). The PCG often met on the occasion of the annual ISF Congress and provided a report to the Phytosanitary Committee. Through ISF ISHI-Veg was able to be informed of and follow developments related to phytosanitary matters. The five founding countries decided to bring ISHI under the umbrella of the ISF. ISHI then became ISHI-Veg with the establishment of ISHI-F for field crops and ISHI-H for herbage crops.

In 2000 it was decided that ISF would provide the necessary administrative support to the technical group. The transfer of secretarial tasks to Patrick Heffer of ISF was in 2001. Since 2002 Radha Ranganathan, Director of Technical Affairs, coordinates ISHI-Veg activities.

ISHI-veg has become a forum for exchanging information, sharing expertise on seed health testing and facilitating the development of new seed health tests. The members account for 70-75% of vegetable seed that is traded internationally. And that it is successful in this approach, is again confirmed in the case of the Tomato Brown Rugose Fruit Virus. ToBRFV was first discovered in Jordan in 2015 but was already found in Israel in 2014. The virus has spread to Germany, California and Sicily, and is also reported in Mexico. Thanks to ISHI-veg, there is a test available to establish whether tomato seeds are infected with this pathogen.



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New EU regime (and passports) getting closer

John van Ruiten

On 14th December 2019, the new Plant Health Regulation in the EU will come into force. The core of the legislation is finished and published, but still some important issues have to be finalized. Recently, the EU Commission published the draft list of Quarantine diseases and the long list of Regulated Non-Quarantine Pests. The publication was also completed in the context of the prescribed WRO consultation round.

- **A very close connection** between the so-called marketing directives of the EU is going to be created. In the new lists of Regulated Non-Quarantine pests (RNQP's) in the Plant Health Regulation (PHR), a subdivision is made for the commodities/species for which the marketing of seeds and plants and the inspection and certification thereof are regulated through these marketing directives (such as 2002/56 seed potatoes, 2002/55 vegetable seeds, 2008/90 fruit plants).

plants for planting (that is to say all plants that are planted/potted or to be used as propagation material) will be plant passported. So, many ornamental plants (pot plants/bedding plants) will have to bear a plant passport in the stage of professional marketing in the EU after December. If sold directly to non-professional users/consumers, a plant passport is not required, although the plants must fulfill the conditions (free of harmful diseases).

The EU PHR and control regulation are not about tariffs of controls and plant passporting. This is up to the Member States of the EU. Existing differences in tariff systems and height of the tariffs will therefore still exist in the coming years.

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The new lay out of the EU plant passport

In the fruit plant and vine plant sector, also the norms/tolerances/requirements for measures are taken up as annexes to the marketing directives. Many former day quarantine diseases (especially those that are occurring in the territory of the EU) are changing status and will become RNQP. In practical terms, this means that marketed material (the seedlot/plants) still has to be free of the disease, but there will be no official measures on the premises of companies if the disease occurs, unless national legislation is developed for those circumstances.

New passports

From 14th December, plant passports with a new lay out have to be issued by the competent authorities in the Member States. If already attached on the product, old passports will remain valid.

An important change is that some seed crops and all

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It is not yet clear what the final position of the UK will be in the case of a Brexit. In earlier communications from the UK government, it was said that technically the norms for plant passports would be the UK importation requirements and an international phytosanitary certificate is needed to enter the UK market. Recently, the EU also decided about new (emergency) legislation because of the findings last year of TOBRFV (Tomato Brown Rugose Fruit tobamovirus) in tomato crops in some countries. From 1st November, seeds and plants of tomato and pepper have to come from sources that are (inspected and /or tested) free from TOBRFV. Check the published EU legislation for specific requirements.



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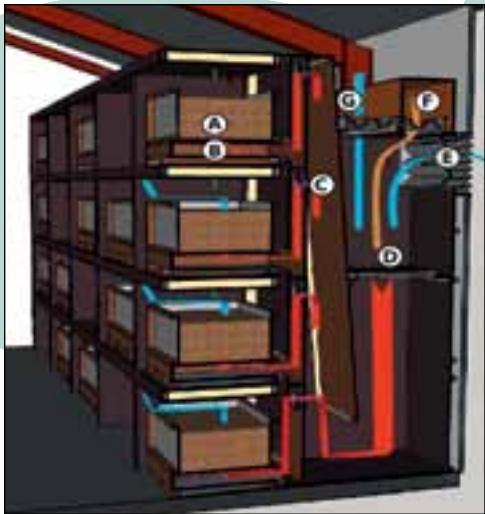
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Individual closed drying units for conditioned drying of seed in boxes.

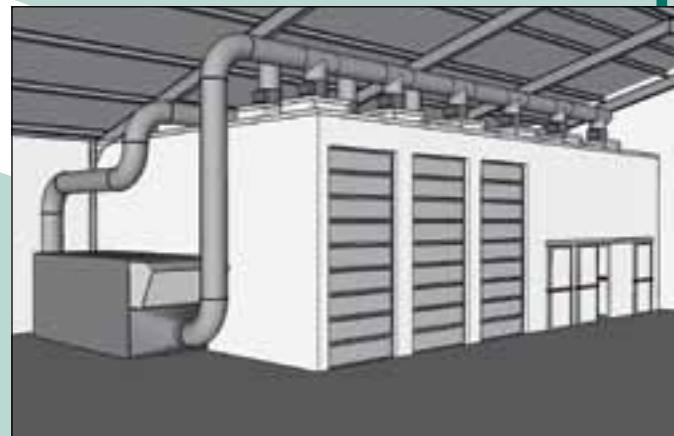


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