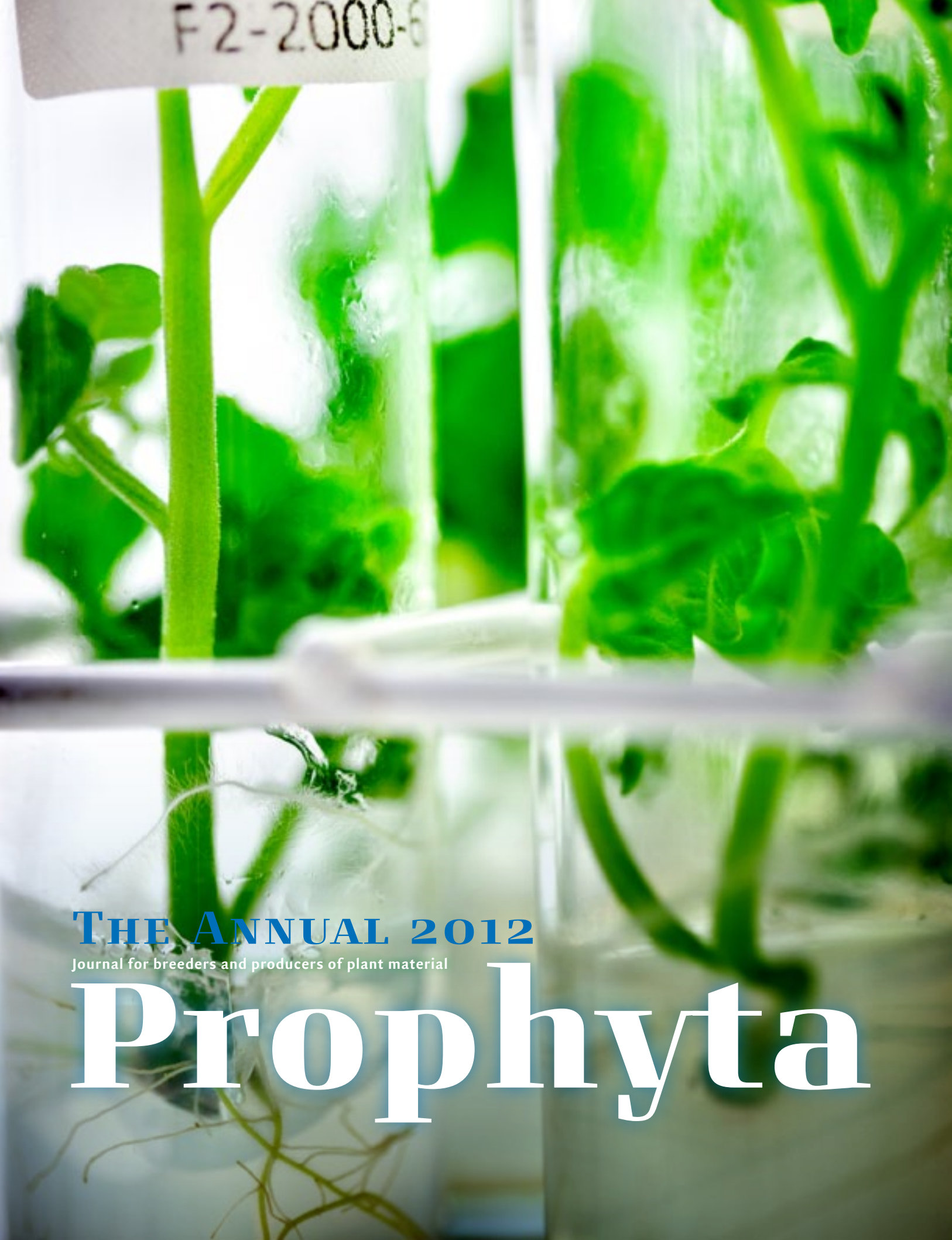

THE ANNUAL 2012

Journal for breeders and producers of plant material

Prophyta

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Prophyta – The Annual 2012
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First hybrid aubergines for Africa

Afrisem, the Tanzanian seed company founded by the Dutch company Rijk Zwaan and the Thai East West Seed Company, presented its first hybrid aubergines specifically bred for African conditions. Local growers are enthusiastic when visiting the trial field. Work on other species is continuing - for instance, on popular crops such as Sukuma wiki, a borecole-related crop, Ngogwe, a local aubergine, pili pili mbuzi, a red pepper, and tomato.
Up until recently, virtually no vegetable varieties were being bred specifically for African growers. By developing commercial hybrid varieties with improved traits for the tropical regions of Africa, RZ Afrisem is now transforming this situation. The newly developed varieties generate a higher yield and exhibit better resistances to diseases than the varieties traditionally cultivated in tropical Africa. Besides displaying improved varieties, the RZ Afrisem demo field also hosts demonstrations of a range of different cultivation techniques. By comparing their current situation with the new possibilities, growers gain insights into how they could take their own cultivation activities to a new level. One of RZ Afrisem's key aims is to ultimately provide African growers with a better chance of a sustainable livelihood.

Strawberry combines looks and taste

Each year, thirty judges from a cross-section of the industry, including journalists, breeders, growers and retailers, are challenged to choose the bedding plant with the biggest 'wow' factor at the all-important point of sale. In June 2011, Fragaria 'Toscana', with decorative, dark pink blossoms and striking cone-shaped fruit, stood out as the favourite from the six top entries.

The garden strawberry (Fragaria x ananassa) 'Toscana' is bred by ABZ Seeds. It was the first fruit that qualified for participation in the FleuroStar contest held every June during the FlowerTrials. The plants were exhibited in highly distinctive displays at eight Fleuroselect member locations: Benary, Combinations, Dümmen, Fides, Florensis, PanAmerican-Seed/Kieft-Pro-Seeds, Sakata and Syngenta Flowers. According to the judges, edible ornamentals are trendy and this stunning example has huge commercial potential, making it an absolute winner.
The seedlings are very economical and environmentally friendly to produce, with excellent, uniform germination.

Impossible combination
Gé Bentvelsen explains: "We are active in three different markets and each market requires its own specific approach. 'Toscana' is meant for the consumer market. It is the result of our breeders' focus to look for an almost impossible combination: obtaining a very tasty, long fruit-bearing strawberry plant with appealing, attractive flowers. And what is an even greater achievement: we succeeded in producing seeds that match all professional demands."
Sowing and handling the plantlets; everything can be mechanised due to the optimal growth of the roots and its suitability for plugs. The resellers are able to choose displays matching their shop formula and selling conditions.

ABZ owner Gé Bentvelsen (middle) received the FleuroStar from Fleuroselect President Nils Klemm (left) and Jan Sijm of Hem Genetics, Chairman of the Evaluation Committee

"In the Floriade, we present this strawberry in a learning environment for children in a kind of Hansel and Gretel house. Strawberries are presented as candy, simultaneously teaching them that strawberries don't grow in a carton box."
ABZ Seeds is a Dutch company dedicated to breeding F1-hybrid strawberries, propagated by seed. These strawberry varieties, with pronounced flavour, are easy to grow under different conditions of soil, climate and seasons.
They have tailor-made strawberry varieties for strawberry growers, bedding plant growers and amateur growers.
For more information: www.abz-strawberry.nl

Incotec GSPP accredited

The GSPP Foundation (Good Seed and Plant Practices) has granted Incotec International the GSPP 2.0 accreditation. In adopting the required protocols, Incotec is taking every measure possible to prevent infection of tomato seeds with Clavibacter michiganesis subsp. michiganesis (Cmm).
It is the first subcontractor to attain this accreditation. GSPP is an initiative of the French and Dutch tomato breeding and plant raising companies, united in Plantum, UFS and SF3P. There have been an increasing number of Cmm outbreaks during the last several years.
The GSPP accreditation will assure growers that their seeds have been handled under strictly controlled conditions and that the seed is in optimal condition to produce a healthy and successful tomato crop.

A doggy's footprint

Three dogs or ten cats need as much food as a human, Wageningen University and Research Centre calculated. The ecological footprint of a person in north-western Europe is 12,500 m². For an average dog, 2,000 m² is needed to produce sufficient food. In the discussion how to feed the world population, so far hardly any attention has been paid to pet animals, while they too need calories and space. In the Netherlands, there are 192 cats, 109 dogs and 25 horses per 1,000 inhabitants.

Luring thrips with odours

Western flower thrips can be lured from its hiding place by specific odours. This facilitates thrips control. The odour of methyl isonicotinate makes Western flower thrips restless. This was demonstrated by scientists of Plant Research International, part of Wageningen ur, and the New Zealand Institute for Plant & Food Research. Addition of methyl isonicotinate to air blown over these small insects increased their walking and take-off behaviour. This substance has been discovered and is patented by the New-Zealand partner (and is already sold under the name Lurem-tr by Koppert b.v. and Pherobank). Both research institutes are now collaborating in the development of other applications of the substance to lure and control thrips.
The presence of thrips can be monitored by placing lure traps but this is not an effective method to prevent sucking damage to plants and the spreading of viruses by thrips. Blowing air with methyl isonicotinate over horticultural crops is promising. The thrips, often hiding in flowers and therefore difficult to kill with pesticides, are stimulated to walk and take off. This improves the chances of a more effective (biological or chemical) control.

www.prophyta.org is the url of Prophyta's website, where you will find more information and can download earlier editions of Prophyta, The Annual.

A valuable gift

For the sixth time, the Nederlandse Tuinbouwraad (Horticultural Council of the Netherlands) has organised the world horticultural exhibition, Floriade. In a 66-hectare park in the south-east of the country, millions of people will become acquainted with the horticultural sector. The Horticultural Council of the Netherlands initiates this every decade in order to share the joy the products of the 14 horticultural member organisations can bring about.
But it is not only the promotion of trees, shrubs, perennials, flowers, vegetables and fruits, but also to fill people in on the lack of elementary knowledge about how food and ornamentals are produced. The fact that this lack of knowledge, and of respect, among consumers is a problem can be deduced from the appalling amount of food that is wasted. Of the 654 million tons of food that are produced in Europe every year, consumers throw away 70 million tons. About 45% of all fruits and vegetables end up in the garbage bin. It gets wasted either by producers, the processing industries, in supermarkets or in the refrigerators of the consumers. Where seed companies worry about whether they will be able to develop varieties that are capable of meeting the growing demand for food, most Europeans take it for granted that there will always be a more than sufficient supply for their daily meals.
Telling people what food production is all about is not very effective, showing it in an unobtrusive way is a far better way to communicate the valuable contribution horticulture makes to society. Every part of the food chain is demonstrated in Floriade, from breeding and seed production to the final touch the chefs give to create great dishes. It shows visitors the regional and cultural background of what is considered tasty and it even gives an insight into the future: what will we consume more than a century from now, and what do astronauts eat? It is clear that the design has succeeded from the cnn-advice, which marks it as a top world destination for tourists.
It is thanks to the gift of the Horticultural Council of the Netherlands and its member organisations that consumers are once more able to get to know the horticultural sector. And what will the Council do in the meantime? Under the guidance of its President, Nico Koomen, they will be preparing the 2022 edition of the Floriade, as the next location will be announced before this year's exhibition ends. It is the ongoing effort of the Dutch horticultural industry to make themselves known and appreciated.

Monique Krinkels

In Short

Interactive salad

Whether you need a new recipe for a salad, want to know more about the vegetables that can be eaten raw, are in search of historical facts or salad-related quotations, or simply like to read comments other salad-lovers have made: it can all be found on www.lovemysalad.com. The interactive platform for salad lovers, which connects consumers and professionals, is an initiative of Rijk Zwaan. With it, they have created a site where anyone with a passion for fresh salads can join in, share their knowledge and inspire others.

Seed companies among top-investors in R&D

In a list of the 30 companies that invest most in research and development in the Netherlands, 2 seed companies appeared. Number 13 on the list, Rijk Zwaan spent 44 million euro in 2011 on R&D in the Netherlands, and 66 million euro worldwide. Number 16 was Nunhems, who spent 40 million euro at home and 56 million euro worldwide. Also on the list was Keygene, with a total of R&D expenditure of 16 million euro.

Rubber from dandelions

The raw material for rubber is extracted as a milky liquid that flows from the bark of rubber trees, mainly in Asia. But the price of rubber is increasing and the cultivation of rubber trees is vulnerable to disease. There could be an alternative available within 10 years: rubber from European plantations that grow dandelions or guayule shrubs, according to PRI scientist, Robert van Loo. In the EU-PEARLS project, scientists from PRI and Wageningen UR Food & Biobased Research are aiming to upscale the production of isoprene (the raw material for rubber) from Russian dandelions and guayule shrubs to such an extent that it will become a commercially viable alternative. Scientist, Hans Mooijbroek, says that it is already possible to produce 1.5 tons of rubber from a hectare of guayule. He expects that within 10 years, it should be possible to market these alternative rubbers. In addition to rubber, the same shrubs could be used as a source for inulin, a food supplement and raw material for sugar substitutes.

New grass for European soccer players

Barenbrug is ready to help Ukraine and Poland to optimize the grass in the soccer stadiums to be used for the European championship this June. Shortly before the games start, a UEFA-delegation of grass experts will visit the host countries to evaluate the condition of the pitches. In many cases, this means that stadiums get fitted with a new pitch in order to live up to the high UEFA standards. The other pitches which are not being returfed will be over-seeded. UEFA uses an open enrolment; every sod company in the world has the opportunity to claim the contract. However, this century Barenbrug grasses were used in all world and European championships, among others in Korea, Germany, Portugal and South-Africa.

Barenbrug has developed a perennial ryegrass, specifically bred for high wear areas such as soccer fields. The so-called Regenerating Perennial Ryegrass (RPR) produces pseudo-stolons and is extremely hard-wearing. Although RPR is still recognized as a perennial ryegrass species, it has been clearly identified as having unique characteristics. Therefore, it was recently placed in a genetic category of its own: Lolium perenne stoloniferum. It is the first time since 1836, when Dr. Lawson used it to describe a class of regenerating perennial ryegrass, that a variety has been recognised as a Lolium perenne stoloniferum. Since then, nothing has been bred or identified in this class of perennial ryegrass.

Fleuroselect awards three Gold Medal winners

THREE BREEDERS from Hungary, Germany and the Netherlands are the proud Fleuroselect Gold Medal 2013 Winners. The medals are awarded to novel varieties that have been tested by Fleuroselect's expert and independent judges at trial grounds across Europe and proven to clearly supersede existing varieties in terms of breeding innovation and beauty.

The Research Institute for Fruit Growing & Ornamentals from Budapest, Hungary presented a stunning new colour in Celosia argenta plumose, named 'Arrabona' after an ancient Hungarian city. It is a creation of professor Zoltán Kováts, master breeder at the Research Institute. The judges were impressed with the variety's vivid novel colour, superior garden performance and overall uniformity (1).

Selecta Klemm from Germany is the proud winner with the Dahlia cultivars sel, named 'Dalaya Yogi', after the master of garden meditation. 'Dalaya Yogi' will use its karma to charm gardeners with dark seductive centres and its exceptionally longer flowering season. This early flowering, medium vigorous, mildew tolerant Dahlia is an alluring new addition to the current range of cutting-raised garden Dahlias. At the Fleuroselect trials the expert judges voted this gorgeous garden Dahlia as the newest cutting-raised Gold Medal winner (2).

Dutch breeder Floragran presented a new Lewisia cotyledon 'Elise'. A Fleuroselect Gold Medal is awarded to real breakthroughs in ornamental breeding and a first-year flowering Lewisia needing no vernalisation thus offering a substantially shorter cultivation period fits the bill. During the Fleuroselect trials held at 15 locations across Europe, Lewisia cotyledon 'Elise' flowered profusely in the first year, leaving the competition way behind. The judges were particularly impressed with the improved germination and the exceptional heat tolerance (3).

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The Prophyta Foundation is an independent non-profit organisation, aiming at informing interested parties worldwide about developments in e.g. plant breeder's rights, breeding techniques, genetics, biodiversity, technology, regulations, phytosanitary matters and more. Our communication methods include at present our Prophyta Annual and our website www.prophyta.org. The Foundation primarily works with volunteers, but in order to recover costs for these activities we need advertisements for our annual magazine and/or direct financial support to the Prophyta Foundation.

We greatly acknowledge the companies mentioned below for supporting Prophyta, by either advertising or donating. Please feel free to contact our secretariat (P.O. Box 40, 2370 AA Roelofarendsveen, the Netherlands, email: foundation@prophyta.org) to join membership of our distinguished group of agricultural and horticultural companies, both for further information or for donations.

Abrasem	Brasilia, Brazil	www.abrasem.com.br	Brazilian Seed Association
ABZ Seeds	Bovenkarspel, the Netherlands	www.abz-strawberry.nl	F1-hybrid strawberries
Agri Information Partners	Wageningen, the Netherlands	www.agripartner.com	Computer software
Agro Business Solutions	Grootebroek, the Netherlands	www.agrosolutions.nl	Computer software
Agronomix	Winnipeg Manitoba Canada	www.agronomix.com	Computer software
Bejo Seeds	Warmenhuizen, the Netherlands	www.bejo.nl	Vegetable seeds
Corn. Bak	Assendelft, the Netherlands	www.bromelia.com	Bromeliads
De Groot en Slot	Broek op Langedijk, the Netherlands	www.degrootenslot.nl	Allium
Enza Zaden	Enkhuizen, the Netherlands	www.enzazaden.com	Vegetable seeds
Feltrin Sementes	Farroupilha, Brazil	www.sementesfeltrin.com.br	Vegetable and ornamental seeds
Fleuroselect	Noordwijk, the Netherlands	www.fleuroselect.com	Organisation for ornamentals
Naktuinbouw	Roelofarendsveen, the Netherlands	www.naktuinbouw.nl	Inspection, varieties, testing
Nickerson-Zwaan	Made, the Netherlands	www.nickerson-zwaan.com	Vegetable seeds
Nunhems Zaden	Haelen, the Netherlands	www.nunhems.com	Vegetable seeds
Rijk Zwaan	De Lier, the Netherlands	www.rijkzwaan.nl	Vegetable seeds
Rossen Seeds	Hem, the Netherlands	www.rossenseeds.com	Vegetable seeds
Suet Saat- und Erntetechnik	Eschwege, Germany	www.suet.de	Pelleting and seed coating
Syngenta Crop Protection	Basel, Switzerland	www.syngenta.com	Seed protection
Takii Europe	De Kwakel, the Netherlands	www.takii.nl	Vegetable and flower seeds
Takii & Co., Ltd.	Kyoto, Japan	www.takii.co.jp	Vegetable and flower seeds
American Takii, Inc.	Salinas, CA, USA	www.takii.com	Vegetable and flower seeds

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'The power of Brazil makes it an ideal venue'

Monique Krinkels

It is with great pride that Mr. Ywao Miyamoto invited his fellow seedsmen to come to Rio de Janeiro this year. The President of ABRASEM is expecting 1,200 participants from 54 countries to attend the ISF World Seed Congress 2012. "The power of seed business in Brazil makes the country an ideal venue for this event", he states.

Brazil has the 5th largest territory on the planet, thereby favouring the development of agriculture. Agribusiness represents 30% of Brazilian GDP, based in part on seed production, which itself occupies an area of 1,700,000 ha.

It is, as far as I can remember, the first time the World Seed Congress will be held in your country. Why is that?
"Indeed this will be the first time in Brazil. As an active member, it seemed natural to have Brazil host this important seed trade event. Brazil is a big player in the seed trade of the world."

How long have you been President of the Brazilian Seed Association, ABRASEM?
"For 13 years, since 1999. I was re-elected four times.

Besides that, I was President of FELAS – Federación Latinoamerica de Semillas in Colombia for two periods, from 2004 to 2006 and from 2008 to 2010. I was also President of the international Congress Panamericano de Semillas in Fortaleza, Brazil, in 2006. And now I'm President of the National Organizing Committee of the World Seed Congress to be held in June 2012 in Rio de Janeiro, Brazil."

What do you do in daily life?
"Besides the presidency, I own the company Sementes Mauá near Londrina, in the province of Paraná. It is a company that sells soy and wheat and was founded in 1974. The company is renowned for its quality seeds as we have a strict control of quality throughout the process, from planting through to commercialization. We have a NBR ISO 9001-2008 certification for all our processes."

What will be the most important topics under discussion this year?
"This year, many important subjects will be submitted for discussion and approval by the members. I would say that the most important issues are the adoption of the International Seed Trade Rules, the position on the Intellectual Property Rights and the GM database."

What does the future of the Brazilian seed industry look like?
"Our agricultural research is pretty advanced in all sectors of agriculture. Notably on crops such as coffee, sugar, soybeans, corn, wheat, fruits, flowers and rice. We have a close and good relationship with the Ministry of Agriculture and this helps us a lot in agriculture."

Brazil is well known for its beautiful scenery and as a rich source of biodiversity. Do Brazilian breeders profit from that abundance?
"The power of seed business in Brazil makes the country an ideal venue for this event, but the beauty of the country is an added value. Tourism is important for Brazil. Last year, there were around 8 million foreign visitors. The revenue reached R$ 11.1 billion (3.95 billion euro), R$ 185 million more than in 2010."

A Tropical Agricultural Giant

Brazil feels up to the challenge

Jos van de Vooren

Numbers confirm that Brazilian agribusiness is modern, efficient and competitive. This places the country among the most competitive countries in the world with the capacity to meet the increased demand for food.

According to the Brazilian Ministry of Agriculture, Livestock and Food Supply (MAPA), the 2010/2011 harvest will lead the country to a new record grain production of 161.5 million tons. The result is 8.2% above the previous harvest, with positive growth of 3.8% in acreage and 4.2% in productivity. Gross Value of Production in 2011/2012 may reach US$ 198.7 billion.

World leader

Brazil is a world leader in the production and export of various agricultural products. It is the first producer and exporter of coffee, sugar, ethanol from sugar-cane and orange juice and is leader in exports of soy-bean (meal, oil and grain). For the future it is foreseen that the most dynamic products in agribusiness will be cotton, soy-beans, beef, chicken, sugar, pulp and paper.

There has been a great performance also in cattle, with expectations of gross revenue of US$ 105.4 billion in 2011, growing approximately 7.6% over 2010. The production of meat (beef, pork and poultry) will increase by 12.6 million tons by 2018/2019, according to forecasts by MAPA. This represents an increase of 51% in relation to meat production in 2008.

Forage grass

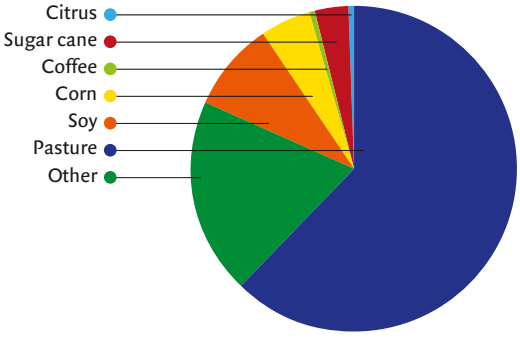
Extensive livestock farming predominates in Brazil and is the agricultural activity that occupies the largest area. Approximately 172 million hectares are home to a herd of 190 million head of cattle. Considered one of the activities with greater impact on the environment, livestock is associated with expansion of agricultural land and accounts for about 60% of total emissions of Greenhouse Gases (methane) in the country.

The implementation of social and environmental criteria in providing financing to the sector and the adoption of good manufacturing practices, such as breeding, improvement of pastures and integration

With 30.3 million hectares Brazil is the 2nd largest producer of biotech crops

Jos van de Vooren is independent consultant in Brazil

Agricultural land use in Brazil
(in million ha)



of crop-livestock, can increase the productivity per hectare and decrease the pressure of this activity on the tropical forest. According to the FAO, during 2010, cattle were grazing on some 24 million hectares that was forest in 2000. Any stimulus given to the production of livestock will increase the demand for forage seeds, particularly the best quality, as a result of larger investments in the establishment of cultivated pastures.

Forage grass seeds

Australia has been a traditional supplier of forage seeds to Brazil. Genetic material from these introductions has been maintained, evaluated, compared in Brazilian gene banks, used by research centres all over the country and included in local strains. However, most of the volume of forage seeds marketed in Brazil is from other sources. Seeds are collected by individuals in pastures that do not belong to them, or in areas invaded by the roadside forage. The production is sold to local traders who buy from several other producers. Obviously these seeds are of varying quality, but generally low. Lots may contain soil, plant debris, malformed seeds and empty glumes. Deliberate adulteration with sand is frequent. Merchants sell these seeds - on the basis of weight - directly to farmers, intermediaries, or seed companies.

Soy

Brazil is the second largest world producer and exporter of soy-beans, soy-bean meal and soy-bean oil. It accounts for about 28% of world production of soy-beans, with the harvest for 2010/11 estimated at around 75 million tons. The Soy-bean Complex, which includes the chain of production of soy-beans, meal and oil, is one of the main items of the Brazilian Trade Balance and exported about US$ 29 billion in 2010, making the country the world leader in the sector's exports in value. Brazilian soy-bean crop area has increased from 13 million ha in 2001 to 24 million ha in 2011. The GM soy adoption rate is above 50% and increasing with strong regional differences.

Regulation

The production, trade, export, import and other activities relating to seeds and seedlings in Brazil are governed by Law 10.711/03 and regulated by Decree 5.153/04. Most relevant rules and regulations, all in Portuguese, can be found here: http://www.ibraflor.com/legislacao.php

Planted area in Brazil (1,000 ha)	Crop 10/11
Cotton	1,304.7
Peanuts Total	90.9
Peanuts 1st harvest	69.6
Peanuts 2nd harvest	21,3
Rice	2,866.2
Oats	153.8
Rapeseed	31.0
Rye	2.4
Barley	82.3
Beans total	3,885.3
Beans 1st harvest	1,450.6
Beans 2nd harvest	1,641.6
Beans 3rd harvest	793.1
Sunflower	73.4
Ricinus	242.8
Corn total	13,166.7
Corn 1st harvest	7,690.4
Corn 2nd harvest	5,476.3
Soy	24,033.9
Sorghum	710.8
Wheat	2,149.8
Triticale	50.3
Brazil total	48,859.6

Source: CONAB

Seeds and seedlings law

The production of agricultural seeds in Brazil has been undergoing profound changes, mainly due to two reasons: firstly, the passage of the Plant Variety Protection Law in 1997, and secondly the advancement of biotechnology.

Embrapa (Empresa Brasileira de Pesquisa Agropecuária) is the Brazilian agricultural research institute and is directly linked to the ministry of Agriculture. Embrapa is responsible for the production of 500 tons of certified soy-bean seed. Quality is guaranteed through minimum standards of germination, varietal purity and health as required by rules of production and marketing established by the government. As the Brazilian law allows farmers to produce seeds for their own use, approximately half of the planted seeds are not certified. The Seed Law, adopted in 2003, sets restrictions for replanting seeds for medium and large commercial farmers.

The collaboration between the public and private sectors occurs through technology partnership contracts. In the area of soy-beans, Embrapa is the leader in contracts with private companies. The partnerships include trials for cultivar evaluation and the exchange or licensing of genes to genetically modified plants. An example is the contract of partnership between Embrapa and Monsanto, signed in 1996, for the development of transgenic soy-bean tolerant to glyphosate. As a result of this partnership, 18 varieties of soy-bean developed by Embrapa had

incorporated the RR gene licensed by Monsanto. The two companies have agreed to the creation of a fund for projects in biotechnology, extending the technical cooperation for joint development of other transgenic crops.

Key players

These two facts increased the demand for investment and modernization and, as a consequence, the industry went through a process of concentration. There were acquisitions, mergers and implementations of their own structures by the global agrochemical players in order to gain market share in Brazil.
These acquisitions include the soy-bean division of FT-seeds, a leader in soy, and the corn division of Agroceres - the largest Brazilian seed company at the time - both bought by U.S. Monsanto in 1996 and 1997, respectively. In 1998, four other national companies were acquired by Dow AgroSciences, while Monsanto acquired part of three other multinationals operating in Brazil. In 1999, Agrevo - later acquired by Bayer - purchased three Brazilian companies in the corn and soy-bean sector. That same year, DuPont acquired a company in the corn sector and the corn division of Pioneer.
Acquisitions continued throughout the next decade. In 2005, Nidera acquired 100% of the programs for soy-beans and corn in Brazil owned by Bayer. In 2007, acquisitions came to a head with the purchase of the seeds division of Agromen - a leading Brazilian company in corn seed with a market share of 11% - by Dow AgroSciences. That same year, Monsanto acquired 100% of Agroeste, another Brazilian company leader in hybrid corn seeds.
Currently, the market is represented by the public sector, multinational corporations and small local companies. The share of each market segment varies, depending on the type of cultivation, with differentiated competitive capacity on each link in the chain of production, including breeding, production, marketing, distribution and technical assistance. There are companies that dominate the entire chain, with great capacity for investment in the area of plant breeding. There are other companies that operate only as multipliers of genetic material developed by national institutes and private national and international companies.

Major trends in production (million tons)

	2010/2011	2020/2021	Increase %
Rice	12.5	13.7	9.9
Beans	3.5	3.8	8.9
Corn	52.9	65.5	24
Soy	68.7	86.5	25.9
Wheat	5.3	6.2	16.1
Total	142.9	175.8	23

Source: MAPA

The South American Flower Production Centre

Famous Brazilian soap-series boosts flower sales

Jos van de Vooren

16 **With a turnover of approximately 7 billion euros, the horticultural sector is not one of the biggest agricultural sectors in Brazil. Though it is the biggest in South America, and it is expected that the sector will continue to grow, partly as the result of the growing income per capita.**

The horticultural sector in Brazil generates some 200,000 direct and indirect jobs. Mainly due to the fact that it is a relatively labour-intensive sector there is, although still limited, a growing awareness of the horticultural sector within the Brazilian government.

Vegetables

Most Brazilian vegetables - 8.8 million tons according to FAO - are produced as open field crops. A small percentage, some 2% - mainly bell peppers and tomatoes - is produced in greenhouses. Most of these greenhouses are only half-open plastic greenhouses, or just a simple construction of shading nets. As a consequence, current vegetable production meets neither the required quality standards nor the increasing demand for higher quality by the customers. There is a lack of good manufacturing practice, knowledge, post-harvest treatment, packaging, storage and logistics. A well-organized production chain is lacking. The number of incidents of pesticide residues on products in supermarkets is high. According to some Brazilian greenhouse builders, there is a slight increase in the demand for greenhouses, including technique, for vegetable production.

Flowers and plants

Especially the production of cut flowers and plants has shown a remarkably positive development in recent years, and is seen as one of the most promising sectors of intensive horticulture. Since 2005, turnover has doubled to 1 billion euros in 2010 and production grew by 10% a year, and the expectation is that this grow rate will continue in the coming years. Turnover can be divided into three main parts, vase flowers (50%), cut flowers (40%) and ornamental flowers (10%). The growth is mainly caused by the growing demand from the domestic market.

The Brazilian horticultural sector did well during the recent economic crisis, which can be explained by the significant increase in buying power of the Brazilian social middle-classes. The Brazilian market for flowers and ornamental plants must be understood in light of developing countries' consumption patterns, predominated by low per capita consumption indexes, relatively small numbers of frequent buyers and purchases of mainly traditional products.

Television

Demand is strongly seasonal and related to special events like weddings and commemorative dates, such as Mother's Day. Sales of flowers and plants by supermarkets and retailers, which took off some five years ago, have been an important impulse for the sector. This led people into the habit of buying plants: going to the supermarket and also taking a bouquet of flowers home. Through a special agreement with Veiling Holambra, nowadays flowers also appear prominently in the famous Brazilian soap-series on television that are watched by many millions.

The flower auction, Veiling Holambra, with an excellent infrastructure and a well-developed marketing system, is a driving force in the sales of ornamentals within Brazil. Veiling Holambra is the main centre for the commercialization of flowers and plants and responsible for 45% of the national market. Some 400 suppliers are members of the cooperative.

Not only flower and plant sales increased in recent years, but also those of ornamental plants for landscaping projects. The sales of flowers through the internet does not yet represent a large portion of the total value, but with a growth of 50% last year, the expectations for the future are very optimistic.

Exports

Only 3% of total production, with a value of 22.3 million euros, is exported, mainly to the Netherlands, United States and Italy. Hippeastrum bulbs and Chrysanthemum cuttings are the main export items. The high cost of production due to the tax burden, the unfavourable exchange rate and cost of transport, means that prices for most products are not competi-

Jos van de Vooren is independent consultant in Brazil

Today the main focus of Holambra is on the production of cut flowers and plants.

tive abroad. The price for producing a rose in Brazil is 30% higher than in Colombia or Ecuador.
With a population of 190 million consumers, the domestic market size justifies the concentration of consumption within the country. Latin American producing countries like Colombia and Ecuador, with small home markets, export about 90% of their production, mainly to the United States.
Brazilian producers are looking for tools to further strengthen the culture of buying plants in the country. One is Expoflora, a fair held annually in September in the city of Holambra. Last year, 300,000 people visited the event. It is the largest horticultural fair for the general public in Latin America.

Production

Some 300 different varieties of ornamentals are produced on approximately 9,000 ha by 8,000 small, medium and large producers. These numbers are all estimations as there are no reliable statistics available. The positive results from the sector created the development of new production areas throughout the country, like in the state of Ceará in the north of the country. Some north-eastern states, like Pernambuco and Bahia, have started to increase the production of especially tropical flowers. The main producing state is São Paulo, which accounts for more than 70% of national production of flowers. The most important horticultural production area of Brazil is situated in Holambra, in the state of São Paulo.

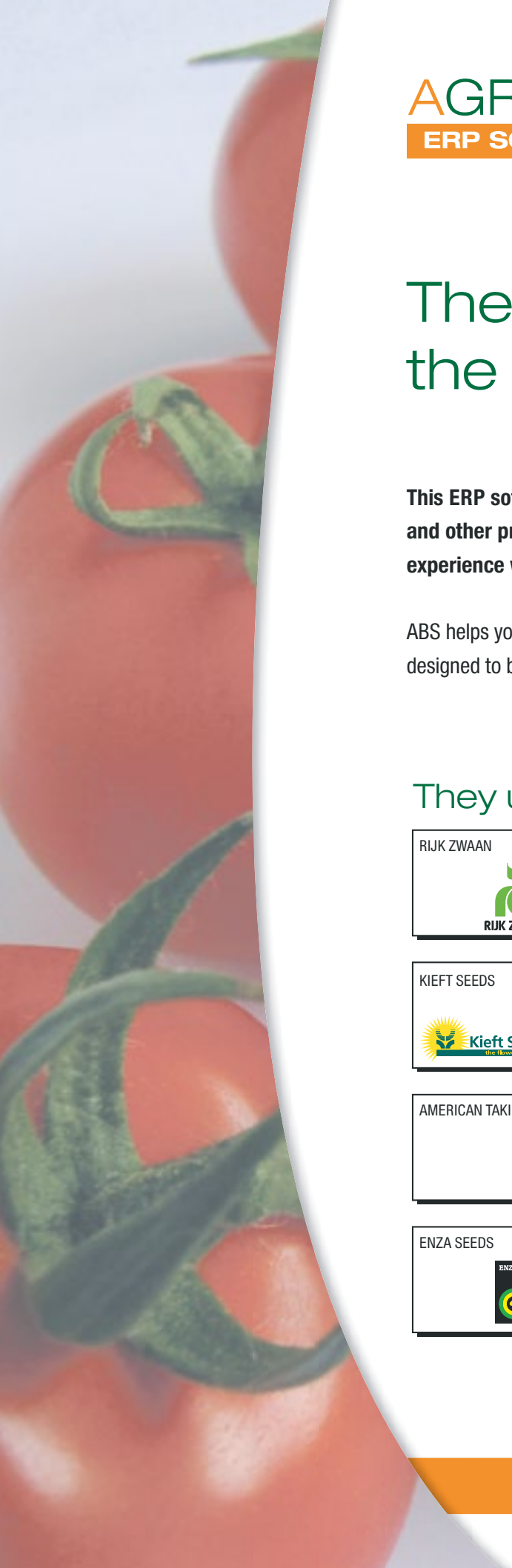
Floriculture in Brazil

Producers	8,000
Cultivated area	9,000 ha
Average size property	1.5 ha
Direct jobs	3.5 persons/ha
Species produced	300
Wholesale centres	40
Wholesale companies	600
Retail points	25,000
Consumption per capita/year	euro 6.00

Source: IBRAFLOR

Holambra

At the end of World War II, the Dutch government encouraged the migration of a particular part of the population to countries like Australia, Brazil and Canada. Brazil was the only country to allow the arrival of groups of migrants. With the consent of the Dutch government, the Catholic Dutch Farmers and Horticulturists Union (in Dutch: Katholieke Nederlandse Boeren- en Tuindersbond) sent a commission to Brazil to coordinate the migration of the Dutch and to secure an agreement with the Brazilian government.
A group of about five hundred Dutch (Holland) catholic migrants from the southern province of Noord-Brabant, with the financial help of the Unites States of America, settled in Brazil (HolAmBra). They settled down on an old farm, called Ribeirão, in the state of São Paulo. The 5,000 hectares of the original farm were divided into lots and distributed among members of the group, with the commitment to develop any productive activity. In 1948, the Holambra colony and the Cooperative Agro Livestock Holambra were founded, in order to produce milk and dairy products. As the Dutch cattle brought by migrants were decimated by tropical diseases, they opted for pig and chicken breeding. With the coming of a new group of migrants from the Netherlands in 1951, some started growing flowers and, in particular, the production of Gladiolus.
Today the main focus of Holambra is on the production of cut flowers and plants. There are some 300 hundred producers of ornamental plants and cut flowers, with an average production area of 20 ha. Based on the idea of a group of businessmen, who felt the need to have an event in Brazil in line with major exhibitions abroad, where participants could make contact with exhibitors, meeting the needs of industry and doing business, the Hortitec fair emerged.



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Floriade 2012

Enjoying 66 hectares of beauty

To commemorate 400 years of diplomatic relations, the Turkish President Abdullah Gül and his wife came on a state visit. Together with Queen Beatrix, he opened the Turkish pavilion. It gives a unique view of traditional and modern Turkey

Hajo P. Strik

According to the CNN tourist guide, Venlo, the Netherlands, is one of the top world destinations in 2012. The reason: it is the city where the World Horticultural Expo Floriade is held. Until 7th October, consumers as well as horticultural specialists can enjoy 66 hectares of sheer beauty.

Her Majesty Queen Beatrix officially opened the Floriade 2012 on 4th April 2012. This famous horticultural event is organised every decade and this year it is the sixth time since 1960. From the outset, it was meant as a presentation to the general public of the latest possibilities and products professional horticulture can offer.

Breeding

Many seed companies have their own presentations at Floriade. Whether it is vegetables, flowers, grasses or potting plants, they are all present. In addition, Plantum, the Dutch association for plant reproduction material, participated in Villa Flora. “At an early stage of our preparations, we decided together with our members to aim our presentations at the results of breeding, instead of showing for instance breeding techniques”, says Niels Louwaars, managing director of Plantum. “To understand breeding is not easy for the average Floriade visitor. One needs basic knowledge and an incorrectly understood explanation might lead to misunderstanding.”
In the central Dome, the Dutch Horticultural sector presents a movie in which Plantum participated. It is an eye-catcher, as the movie is projected on the circular wall of the Dome, which gives the spectator the feeling of standing in the middle of the scene. It is the fourth such theatre in the world. “By means of a combination of animation and real pictures, the visitor is shown in an appealing way what the horticultural sector is all about,” adds Niels Louwaars. “I would like to emphasize that, thanks to the active role and support of our Plantum members and their separate presentations at the Floriade, the importance of breeding and plant reproduction is demonstrated.”

Inspiration

Professional visitors from abroad are most welcome and will find a multi-lingual team of guides at their disposal. Breeders will be surprised to find so many variations and will certainly leave with new ideas. To emphasize the huge variation of plants: 1.8 billion bulbs are planted, 18,000 shrubs, 190,000 border plants, 15,000 hedges, 5,000 roses and 3,000 trees. In five different themes, called Relax & Heal, Green Engine, Education & Innovation, Environment and World Show Stage, the visitor finds surprising combinations of flowers, fruits, trees, shrubs and many other natural products. One can have a bird’s-eye view of the 66-hectare fairground with a ride on Europe’s largest aerial cable car system.

More information: www.floriade.nl

International movement of seed is assigned number one priority

Radha Ranganathan

At the seventh session of the Commission on Phytosanitary Measures in March 2012, among topics for international standards, the 'international movement of seed' received the highest priority and was placed under the strategic objective of enhancing food security. This new standard is expected to be adopted by the CPM in 2016.

Why are phytosanitary regulations so important to the seed industry?

Seed is life! Because seed for planting is frequently moved around the world, it has the potential to be exposed to exotic pests and diseases and serve as a pathway for the unintentional introduction of plant pests into new environments. For this reason, many countries have phytosanitary restrictions for the movement of seed.

The international movement of seed is, however, central to agricultural production in many, if not all, nations. Quality seed is the first step in the production of food, feed and fibre. The development and production of seed involves incorporation of new traits through selection and breeding programmes, followed by seed increase programmes to produce enough seed with the right traits for yield, pest and disease resistance, drought and salt tolerance, and many other factors. Research and development in seed is now done internationally so that researchers can access new genetics, new environments and new knowledge. Local breeding and trials must occur to determine whether new crops have properly adapted. While the benefits to the country are obvious, new sources of pest resistance are regularly discovered through this process.

Seed is often moved into and out of many countries in pre-commercial as well as commercial stages. It is in the interest of the seed industry to ensure the safe movement of seed in international trade in order to protect agriculture, human health and the environment.

The mission of the ISF is to facilitate the international movement of seed for planting within the framework of fair and reasonable regulations. Phytosanitary regulations play an important role in the international movement of seed. ISF recognizes that countries may exercise the sovereign right to utilize phytosanitary measures to regulate the entry of plants and plant products and other materials capable of

Guidelines for companies on handling phytosanitary 'issues'

1 Familiarise yourself with the International Plant Protection Convention (www.ippc.int), in particular the international standards that apply to the international trade of seed.

2 Maintain an open relationship with your national plant protection office (NPPO), directly or through your national association, with the aim of being an active partner in upholding the principles of the IPPC.

3 In case of a problem exporting seed or plant material, first contact your agent in the importing country to understand where the problem lies. Your agent may also be able to negotiate on the language and clauses of the import permit.

4 If the problem is not resolved, contact your NPPO directly or through your national association. The implementation of the IPPC involves the collaboration of national and regional plant protection authorities and currently permits only a limited direct participation of the seed industry, despite its significant role in international trade of plant material.

5 Ensure you have all the facts, or at least as much as possible, to be able to relate all the details of the problem shipment to the NPPO.

6 Argue your case using the accepted principles underpinning the IPPC – the necessity of the perceived import restriction, its technical justification, the importance of transparency for all the concerned parties and, finally, minimising the impact of the phytosanitary regulations on international trade.

As conditions change, and as new facts become available, IPPC recognises that phytosanitary measures should "be modified promptly, either by inclusion of prohibitions, restrictions or requirements necessary for their success, or by removal of those found to be unnecessary".

7 Inform the International Seed Federation (ISF) Secretariat, which can be of help in tapping into the collective experience of the ISF membership and contacting the ISF member in the country concerned. It can also assist in spearheading an international industry delegation to the relevant ministries/authorities through the good offices of the national seed association(s) in the countries involved, or speaking in one voice to the IPPC Secretariat. ISF has observer status at the IPPC.

Radha Ranganathan is Director of Technical Affairs at the International Seed Federation, Nyon, Switzerland

foto: Naktuinbouw Public Relations

harbouring plant pests into their territories.

What is the International Plant Protection Convention?

The IPPC is an international treaty to secure action to prevent the spread and introduction of pests of plants and plant products, and to promote appropriate measures for their control. The IPPC affirms the rights of countries to take legislative, technical and administrative measures for the purpose of securing common and effective action to prevent the spread and introduction of pests of plants and plant products. Countries can refuse entry, require treatment or specify other requirements for plants and plant products.

However, in applying phytosanitary measures, governments also have obligations; they have accepted certain principles that underpin the application of phytosanitary measures, viz. necessity, technical justification, modification, transparency and minimal impact. Restrictive measures must be applied only when made necessary by phytosanitary considerations. Phytosanitary measures must be technically justified. They must be published promptly and the rationale for such measures made available to others, if requested. Phytosanitary measures must be consistent with the pest risk and result in the minimum impediment to international movement of goods.

The IPPC is governed by the Commission on Phytosanitary Measures (CPM), which meets annually to promote cooperation and implement the objectives of the IPPC.

How do international standards translate into national regulations?

The IPPC allows countries to analyse risks to their national plant resources and to use science-based measures to safeguard their cultivated and wild plants. It provides an international framework for plant protection that includes developing International Standards for Phytosanitary Measures (ISPMs) for safeguarding plant resources.

ISPMs are the standards, guidelines and recommendations recognized as the basis for phytosanitary measures applied by Members of the World Trade Organization under the Agreement on the Application of Sanitary and Phytosanitary Measures (the SPS Agreement). They are intended to achieve international harmonization of phytosanitary measures, with the aim of facilitating trade and avoiding the use of unjustifiable measures as barriers to trade.

While standards in themselves are not regulatory instruments, they come into force through the import requirements established by countries within their national legislation.

Why do phytosanitary regulations sometimes become unwitting barriers to trade?

Pest risk analyses (PRA) form the basis of phyto-

Our flora and fauna is natural, but cannot be taken for granted

Nature's wealth is abundant and essential for life. At Rijk Zwaan we are acutely aware of this. We develop the very best vegetable varieties and vegetable seeds, every day again, making use of the raw materials and possibilities Nature has to offer us. But we also accept Nature as it is. After all, our aim is to continue developing new varieties for many years to come and that is only possible if we use our knowledge with respect for Nature. That's what we believe in.

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porters sufficient time to secure the required new/changed additional declarations. Basic seed production followed by commercial seed production can take up to three years in some crops and leave the exporter and importer without any means to meet new import requirements.

sanitary regulations instituted by a country. It is a technical tool used for identifying appropriate phytosanitary measures. However, many countries do not have the resources to perform all the PRAs needed, in a timely manner or with the thoroughness they require. This results in uncertainty for growers, importers and exporters.

In some instances, PRAs are required for products that have a 'safe import history', a term used in the WTO SPS Agreement and applied in the context of international trade. A relatively common problem is the additional declarations required for injurious pests for which seed is not the pathway for their introduction or spread.

The WTO-SPS Agreement contains a set of substantive and procedural provisions. The substantive provisions are aimed at protecting human, animal and plant health and life, while preventing unjustifiable barriers to trade. The procedural provisions create a framework to improve communication between members, regarding proposed changes to sanitary and phytosanitary measures and to provide a forum for dispute settlement. However, governments largely avoid disputes on matters related to PRAs, preferring instead a technical consultation to identify suitable alternatives for problem resolution. This inevitably takes time.

Often changes to the import requirements are not notified either with WTO (as per the SPS Agreement) or with the IPPC as per Article VII 2b of the Convention. Changes are implemented immediately without adequate communication to exporting countries. This leads to difficulties with exports, especially if exporting countries require formal instruction/communication from the importing country to modify the required declarations on the Phytosanitary Certificates.

Changes are often implemented without allowing ex-

Will an international standard on seed help?

ISF is pleased that a standard on the international movement of seed is on the work programme of the Standards Committee of the IPPC.

According to the specifications drafted by the Standards Committee, this standard is intended to provide additional guidance to assist NPPOs to identify, assess and manage the pest risk associated with the international movement of seed. It may also result in decreased disruptions in the international movement of seed through increased harmonization of phytosanitary import requirements and a subsequent decrease in the enforcement of phytosanitary import requirements that may not be technically justified.

The standard is intended to identify and describe specific phytosanitary measures that could be used to reduce pest risk associated with the international movement of seed, including phytosanitary measures that may be applied at seed harvest, seed extraction, during post-harvest seed processing, and on arrival, testing and inspection.

A working group of five to ten phytosanitary experts - with expertise in one or more of the following areas: the development and/or implementation of phytosanitary measures to manage pest risk associated with the international movement of seeds, pest risk analysis (PRA), seed testing and storage, knowledge of existing international guidance relating to the international movement of seed - will be constituted to draft the standard. The specifications for the standard recommend that a representative of ISF be part of the expert working group. At the seventh session of the CPM in March 2012, the list of topics for IPPC Standards was reprioritised on a scale of 1 to 4 according to IPPC's new strategic objectives.

Local effort, global impact

Robert D. Hall

There is a need to forge stronger links between fundamental and strategic/applied research in the agrosector. Public-Private Partnerships (PPPs) are seen as an important way forward for Dutch science and Dutch industry.

In 2001, the Wijffels Committee on Biotechnology strongly advised the Dutch government to recognise the then growing importance of genomics research as the life sciences innovation driver for the future. In total, 580 million euro of government funding has since been made available to establish national centres of excellence in genomics with an equal amount of co-funding coming from the participating academic centres and industrial partners. The programme, coordinated under the auspices of the Netherlands Genomics Initiative (NGI) would run for ten years and covers all main areas of biology. One centre, the Centre for Biosystems Genomics (CBSG), was established for crop genomics and breeding. This unique Public-Private Partnership comprises a consortium of seven academic institutions and fifteen companies coordinates a major research programme focused on the two economically most important Dutch horticultural crops, potato and tomato. In total 5 million euro per year has been used to fund new research and these efforts have been 'matched' by in kind contributions from the academic partners.

Excellent results

But is this public money being well spent? In 2011 the CBSG, like all the other Dutch genomics centres, has been subjected to a major independent international assessment. The main aim was to determine whether the whole concept of PPPs in an academic-industrial context for precompetitive research is a successful model. The conclusions of the CBSG committee were crystal clear. Progress has been unprecedented. Such initiatives are unique in the world and other countries are jealous of what the Netherlands has established and achieved. Scoring 'Excellent' for both top quality science and commercial valorisation of results also demonstrates that such a combination is indeed possible and not, as some thought initially, contradictory. Such centres of innovation must continue - but their future is in potential danger considering cut-backs and current national changes to research funding strategies.

Genomics is centred on deciphering the molecular mechanisms controlling and determining what defines and differentiates living organisms. While strictly speaking, genomics focuses on DNA, it is often considered in a broader context covering all molecular levels – from DNA structure (gene), to RNA (gene expression), to protein (gene product) and to metabolite (enzyme product). This science is driven by technology and technological advances in the last decade have truly revolutionised biological research - thus confirming Wijffel's prediction! Never before have we been able to gain such deep insights into the molecular differences determining what defines an organism and differentiates one from another and at any level: individual/ecotype/species/genus, etc. Significantly, from an agricultural perspective, genomics is also making huge inroads towards our understanding of those molecular factors determining differences in crop traits. Hence, we can now better understand how genotype and environment interact – the fundamental basis of varietal difference. This is effectively the very heart of the CBSG research programme.

CBSG example

The CBSG strategy defining its research programme is characterised by strong focus (concentrating on two closely related species, potato and tomato) and establishing close links with Dutch-based industry. The company partners defined the market problems and the challenge went to the academic partners, specifically chosen from all available institutions on the basis of global scientific merit, to help deliver solutions. For each crop additional biological focus was also defined – for potato the target was to find novel sources and mechanisms of resistance to late blight caused by Phytophthora infestans. This disease is still the biggest global threat to production and costs the Agrosector several billion dollars annually. For tomato, the target set was to establish a strategy for defining tomato taste and determining strategies for directed breeding towards taste improvement. Taste is a key factor determining market value and is also central to an ever growing need from the modern consumer for variation in product. Through these well-defined strategies in the last nine years CBSG has been able to make major advances relating to the agreed targets and we are now in a much more favourable position to help breeders improve these key traits in both crops. New varieties are already in the make and are expected to go on the market within a few years.

Robert D. Hall is managing director of the Centre for BioSystems Genomics, Wageningen, the Netherlands, www.cbsg.nl

For a brief English overview of the CBSG Research Programme please refer to the website: www.cbsg.nl. A broader overview of the entire national genomics programme is to be found at www.genomics.nl.

Success should however, not only be defined in terms of scientific merit. Science has major impact on our daily lives and it is recognised that it is our clear responsibility to 'be good and tell it' not only to our scientific peers but also to the consumer/tax payer alike. A unique element of each NGI centre programme therefore concerned a requirement to inform and interact with the general public. Targets were set and a proportion of budget was allocated for outreach activities. In the case of CBSG, a mobile DNA laboratory initiative was established (www.allesoverdna.nl) which has already visited more than 100,000 secondary school children and familiarised them with modern DNA research. CBSG organised a wide range of activities in the UN Year of the potato 2008 and the UN Darwin and Evolution year 2009, again involving many interactive activities with children and adults alike.

PPP as innovation driver

Combining top science and commercial application is not easy, especially in the context of a multi-partner consortium. Keeping research at the pre-competitive level is essential to avoid coming too close to the core business of the individual industrial partners. Working towards a common fundamental goal of benefit to everyone avoids conflicts of interest and enables the creation of the required critical mass to combine efforts and take bigger steps forward. By defining common, long-term goals and uniting complementary scientific disciplines in a coordinated effort, it has proven possible to achieve scientific breakthroughs worthy of inclusion in high impact journals like Nature and Science while still delivering innovative tools and knowledge of direct relevance to crop improvement. Innovation thrives on crossing boundaries and broaching barriers. Technological advances have turned modern biology into a highly multidisciplinary science. Hence, larger projects and more people with complementary expertise are needed to overcome barriers and drive innovation. Consequently, state of the art science demands larger, integrated research programmes to maximise innovation potential. PPPs are a very efficient way not only to achieve this but also to guarantee an early match between fundamental science and future commercial application.

PPPs and Food security

The challenges we face are enormous. Feeding another three billion global inhabitants by 2050 requires a major new boost in food production essentially equivalent to the green revolution of the 1960's. Enhancing crop yield per hectare requires not only new ways to enhance the amount of harvestable product generated by the plant but also reduced crop loss, both pre- and post-harvest. We need a better understanding of those molecular processes determining important traits such as disease resistance / susceptibility; plant growth and crop yield; tolerance to drought and temperature etc. Furthermore, enhanced food (nutritional) quality entails a reduced food intake requirement and hence here also opportunities can be created to feed the world more efficiently with limiting resources. It is only by uniting activities across academic / commercial boundaries and also joining forces with excellent groups across the world in a truly international effort that we shall be able to establish and facilitate global research initiatives to tackle the food security challenge. Making use of state of the art approaches in a multi-disciplinary manner within a PPP context is a clear way forward. On its own, science for science's sake will not solve immediate problems and failure to couple science to industry also will lack efficiency and fail to achieve early release of improved products to a needy public. The Netherlands has provided the proof of concept and we hope this inspires others to follow a similar path.

Unauthorised use successfully targeted by right holder

Bart Kiewiet

Once propagating or harvested material of a variety has been commercially released by the owner or with his consent, this material can circulate freely. The EU Court recently confirmed this rule in the case of Kanzi, a Belgium-bred apple variety.

In a recent judgment[1], the Court of Justice of the European Union (EU Court) has given an important interpretation of the exhaustion rule laid down in article 16 of the Basic Regulation of the Community Plant Variety Protection system[2]. This rule implies that the Community Plant Variety Right (PVR) shall not extend to acts concerning material of the protected variety, which has been disposed of to others by the holder or with his consent. In other words, once propagating or harvested material of a variety has been commercially released by the owner or with his consent, this material can circulate freely. There are some exceptions to this rule, but they were not relevant in this case brought before the EU Court.

The case

Nicolaï NV, the Belgian breeder of the apple variety Nicoter, applied on 27 April 2001 for a Community Plant Variety Right for this breeding. On 24 December 2002, the right associated to that application was brought into the company, Better3fruit, who therefore became the holder of the Community PVR granted for the Nicoter variety. Better3fruit is also the proprietor of the trademark Kanzi, exclusively used for the Nicoter variety.
In 2003, a licensing contract was concluded between Nicolaï and Better3fruit, under which Nicolaï acquired the exclusive right to grow and market apple trees of the Nicoter/Kanzi variety. One clause in this contract is of utmost relevance for the ruling of the EU court:
Licensee (Nicolaï) "...will not dispose of or sell any product covered by the licence unless the other party signs in advance the grower's licence (in Dutch 'teeltlicentie') referred to in Annex 6 (where the other party is a grower) or the marketing licence (in Dutch 'marketinglicentie') referred to in Annex 7 (where the other party is a trader)."

Apparently, Better3fruit wanted to control and/or monitor the production and trade of material of the Nicoter variety.
On 24 December 2004, Nicolaï sold 7,000 apple trees of the Nicoter variety to Mr. Hustin, a Belgian apple producer. In that transaction, Mr. Hustin was not required to sign a license contract with regard to the growing of the apples or the sale of the harvest, at least he did not do so. On 4 December 2007, it was established that a Mr. Goossens was selling apples under the Kanzi trademark at the market at Hasselt, Belgium. It transpired that those apples had been supplied to him by Mr. Hustin.
On the basis of that finding, GKE, the successor of Nicolaï as licensee of Better3fruit, brought a court action for infringement of the Community PVR against Mr. Hustin and Mr. Goossens. The proceedings reached the Belgian Court of Cassation (the Belgian Supreme Court).
The Belgian Court, "uncertain as to the scope to be given to the rule of exhaustion laid down in Article 16 of Regulation No. 2100/94", decided to stay the proceedings and to refer two questions to the EU Court for a so-called preliminary ruling, a binding interpretation of a provision of EU law.
The Belgian Court asked firstly whether it is possible to act against third parties, who have no contractual relationship with the PVR holder, but who have acquired material from a licensee, who did not respect the license contract. If that question were to be answered in the affirmative, the Belgian Court wanted to know whether it is of significance that the third party in question was aware that the license contract had not been respected.[3]

Ruling

In its ruling, the EU Court makes a distinction between the actions brought by the holder against a person enjoying an exploitation right on the basis of a license agreement, in this case first Nicolaï and later GKE, and third persons who affect acts in respect of material of a protected variety, without having a contractual relationship with the PVR holder, in this case Hustin and possibly Goossens.
The EU Court considered that as far as the licensee is concerned, the holder can act against any act that contravenes the contract. Although useful, this consideration was not an answer to the questions of the Belgian Court of Cassation, which concerned the possibilities of acting against third parties and not against the licensee.
Those questions were answered as follows:

1. The relevant articles of Council (EC) Regulation 2100/94 "must be interpreted as meaning that the holder or the person enjoying the right of exploita-

The former CPVO president, Bart Kiewiet, has founded Bart Kiewiet Consultancy and has joined Vondst Advocaten, Amsterdam, the Netherlands, in an 'Of Counsel' capacity.

Nicoter is a cross bred from juicy Gala apples and tangy Braeburns. It is the only variety to produce apples which, subject to quality requirements, are marketed under the KANZI trade mark. For the sake of quality control both for the trade mark and for the apple, growers, packers and marketers have to adhere to the stringent quality specifications and trademark rules of KANZI apples. More information www.kanziapple.com.

tion may bring an action for infringement against a third party which has obtained material through another person enjoying the right of exploitation who has contravened the conditions or limitations set out in the licensing contract that that other person concluded at an earlier stage with the holder to the extent that the conditions or limitations in question relate directly to the essential features of the Community Plant Variety Right concerned. It is for the referring court to make that assessment."

2. "It is of no significance for the assessment of the infringement that the third party which effected the acts on the material sold or disposed of was aware or was deemed to be aware of the conditions or limitations imposed in the licensing contract."

Thus, the EU Court has opened the door to infringement actions against third parties, but only if the breach of the license contract concerns conditions and limitations that relate directly to the essential features of the Community Plant Variety Right. It is up to the Court of Cassation to assess whether this is the case here. The Court does not help its Belgian colleagues by indicating what it considers essential features as such, but it may be assumed that these primarily relate to the exploitation acts listed in Article 13 (2) of the Basic Regulation, that require the authorization of the right holder. This is in line with the position taken by the European Commission in this procedure.[4]

Consequences

Who are the 'third parties' as mentioned by the EU Court? Are these only parties who dealt directly with the licensee, in this case Hustin? Or should parties who did not have a direct relationship with the licensee, such as Goossens in this case, be considered as 'third parties' as well? The EU Court ruled that it is possible to bring infringement actions against third parties who obtained material through (in Dutch 'via', in French 'par l'intermediaire') another person who enjoyed an exploitation right. This seems to imply that not only parties who dealt with the licensee directly, but also parties who obtained the material indirectly from the licensee could be successfully targeted by the right holder. In this respect, the EU Court goes further, in fact, than merely answering the question of the Belgian Court, which restricted its question to the case where material was sold directly to the third party 'by' and not 'through' a licensee of the right of exploitation.

The answer to the second question of the Belgian Court is very clear; as far as the assessment of an infringement is concerned, it does not matter whether the third party knew that in obtaining material from the licensee the latter did not respect the limitations and conditions of the license contract.

One other element in the judgement of the EU Court deserves a mention. The EU Court distinguishes between a 'primary' right that covers variety constituents and a 'secondary', weaker, right that covers 'harvested material'. If the Belgian Court concluded that the breach of the license contract with Nicolaï related to essential features of the Community PVR, this would allow the possibility of launching action against the sale of Nicoter/Kanzi apples by Hustin and/or Goossens, being harvested material "obtained through the unauthorized use of variety constituents", only if the right holder did not have a reasonable opportunity to exercise his right in respect of the variety constituents (see article 13(3) Regulation 2100/94).

1 Judgment of the Court of 20 October 2011 in case C-140/10 (Greenstar/Kanzi)

2 Council Regulation (EC) no.2100/94

3 Should the relevant provisions in Regulation (EC) 2100/94..."be interpreted in such a way that the holder or the person enjoying the right of exploitation may bring an action for infringement against anyone who effects acts in respect of material which was sold or disposed of to him by a licensee of the right of exploitation if the limitations in the licensing contract between the licensee and the holder of the Community plant variety right that were stipulated to apply in the event of the sale of that material were not respected?
If so, is it of significance for the assessment of the infringement that the person effecting the aforementioned act is aware or is deemed to be aware of the limitations thus imposed in the said licensing contract?"

4 See paragraph 45 of the conclusions of the advocate general.

The numbers tell the story

Marcel Toonen, Daniel Bakker and Mariëtte Edema

Plant health testing methods are vital in ensuring the production of healthy high-quality products. These testing methods can be subject to variation and discrepancy, both qualitatively and geographically. Validation of testing methods is therefore necessary to guarantee the standardization of accuracy, quality and efficacy of plant health testing methods throughout the industry.

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Healthy starting material for plant production (seeds and young plants) is the key to production of high quality products for food, feed and ornamental products. Plant pathogenic pathogens present in seeds or plantlets may cause disease or death of plants during cultivation, resulting in crop loss and economic damage. In order to ascertain the health of commercial starting material, visual inspections and health tests are required. In addition, phytosanitary requirements apply to protect food production for crop losses, as well as to protect the environment against invasive pathogenic species. Starting material free of pathogens, as shown by quality or phytosanitary certificates, can be sold abroad without restrictions, because there is little risk that the importing country will be faced with unwanted pathogens. Worldwide plant health testing is carried out in the laboratories of seed and plantlet companies, National Plant Protection Organizations, and governmental and private testing laboratories. The quality and reliability of the results obtained by the performed tests depends greatly on the sampling strategy, the quality of the test protocol and the quality of the laboratory. The quality of the laboratory is heavily influenced by the competence of the laboratory staff and the available facilities. However, even a high quality laboratory is limited if the test protocols are of poor quality. Therefore, the development and validation of reliable and robust test methods is an important aspect in plant health testing.

Performance characteristics

Detection limit Lowest value, in a laboratory sample, of the target pathogen or pest, which can still be determined with a certain degree of reliability.

Repeatability The degree of correspondence between the results of measurements of the same sample(s), performed under varying measurement conditions.

Authenticity The ability of a method to do what it 'says' (e.g. detection of organism A in matrix B). In other words: the ability to detect the target organism in the matrix assessed.

Measuring range Upper- and lower limit within which the analysis can reliably be applied.

Uncertainty of measurement Uncertainty about the result of the measurement.

Reproducibility The degree of correspondence between the results of successive measurements of the same sample(s), performed under equal conditions.

Robustness The degree of insensitivity of the results of a measurement to deviations in procedure, circumstances and nature of materials like these may occur in practice.

Selectivity The ability of a method to distinguish the target organism (pathogen) from other components in the sample.

Analytical specificity The ability of a method to distinguish the target organism (pathogen) from other organisms, whether related or not, and the extent to which the analysis can distinguish (known) variants of the organism.

Epidemic studies

The development of a new test method is performed based on its foreseen application. Based on the selected method, target organism(s), crops to be tested, and whether the method is used for detection or identification, the scope is defined. Development of high quality test methods requires knowledge about the occurrence of pathogens both in the plant and in the geographical production zone. For that reason, epidemic studies are of high importance. Such studies give insight into the relevance of a pathogen for specific production areas, but also what parts of the plant have to be sampled in order to have the highest probability of finding the pathogen concerned. Knowledge about the biological and taxonomical properties of the organism is indispensable. Therefore the availability of pathogen collections is important. Collections not only give insight into the biological diversity within the species that is pathogenic to the crop under investigation, but also gives access to non-pathogenic related species. This information is required to confirm the specificity of the test. In other words, that it will detect all pathogenic isolates within a species, but not the related non-pathogenic species. Also, the availability of naturally infected seed lots or plant material is important, since it allows application of the test under development on 'real life' samples. For instance, the presence of saprophytic bacteria or inhibiting com-

foto: Naktuinbouw Public Relations

ponents in the seed or plant material may obstruct test results. A test can consist of multiple methods, where a first method is applied to detect a specific pathogen and a second method is used to confirm the identity of the pathogen found. In the case of the detection of a quarantine organism, this approach is obligatory as defined by the European and Mediterranean Plant Protection Organization (EPPO).

Wealth of technologies

Various technologies are available to conduct tests on plant material. Besides some classical tests with plants (bio-testing) and morphological identification, a broad range of more advanced methods has been developed in the last decades. Well known is the enzyme-linked immunosorbent assay (ELISA) method, where pathogens are detected based on serology (reaction with a specific antibody). For the detection of plant pathogenic bacteria, enrichment of the bacteria on semi-selective media is often used, especially for seed lots.
The polymerase chain reaction (PCR) can detect pathogens based on their DNA or RNA. This allows specific detection of pathogens. One advantage is that PCR is sensitive, which allows detection of low pathogen levels. During the last decade, PCR technologies have been replaced by real time PCR. This method is even more specific and sensitive, and has a number of practical advantages in the laboratory.
With this wealth of technologies available, scientists are able to develop a broad range of various test methods to detect the presence of pathogens. In order to verify the suitability of a newly developed method for its intended use, validation is applied. Validation is a prerequisite to accrediting a test under the quality system ISO 17025.

Validation

Validation is defined as the confirmation that a method is fit for its intended use. It can be applied to newly developed methods but can also be applied to standard methods. It is important to note that a method or test should first be developed completely before validation can be initiated. Also the requirements for the test should be drawn up in advance. By performing a validation study, using a predefined set of criteria, the performance of the test is determined and it can be concluded whether a method (new or standard) meets the requirements dictated in advance.
Validation will determine the performance characteristics of a number of critical parameters in the performance of the test under different circumstances. Two forms of validation can be distinguished. After completion of the development of a test method, a method validation is carried out to determine the performance characteristics of a new method in connection with the requirements drawn up in advance and the scope. A laboratory validation has to be carried out to determine the performance characteristics of a validated method in a different laboratory from the laboratory where the method has been developed and validated. In this way, it is decided objectively whether a laboratory can properly perform the method.
Performance characteristics (see box) of a method can partly be obtained from scientific literature and are determined by a set of experiments. Depending

Overview of validated methods for detection or identification of plant pathogens

Scientific name	Methodology
Apple proliferation phytoplasma	PCR
Arabis mosaic virus (ArMV)	PCR
Chrysanthemum stunt viroid (CSVd)	PCR
Clavibacter michiganensis subsp. michiganensis (CMM)	plating, PCR en biotest
Ditylenchus destructor	extraction
Ditylenchus dipsaci	extraction, visual identification
Meloidogyne chitwoodi	extraction, visual identification
Meloidogyne fallax	extraction, visual identification
Peach rosette phytoplasma	PCR
Peach X-disease phytoplasma	PCR
Peach yellows phytoplasma	PCR
Pear decline mycoplasm	PCR
Pepinomozaïekvirus (PepMV)	ELISA en PCR
Phytophthora fragariae	Duncantest
Plum pox virus (PPV)	ELISA en PCR
Potato spindle tuber viroid (PSTVd)	PCR
Radopholus similis	extraction, visual identification
Strawberry witches' broom phytoplasma	PCR
Tobacco ringspot virus (TRSV)	ELISA
Tomato black ring virus (TBRV)	PCR
Tomato ringspotvirus (ToRSV)	ELISA
Tomato spotted wilt virus (TSWV)	ELISA
Xanthomonas axonopodis pv. dieffenbachiae	IF, plating, PCR
Xanthomonas axonopodis pv. phaseoli	IF, plating, PCR
Xanthomonas campestris pv.vesicatoria	IF, plating, PCR

on the scope of the method, certain performance characteristics may be more relevant than others, where in some cases certain performance characteristics may not be relevant at all. A detailed description on how to conduct a validation study for plant pathogen testing methods is described in the EPPO standard: "PM 7/98 (1): Specific requirements for laboratories preparing accreditation for a plant pest diagnostic activity". This standard was formulated for the Dutch phytosanitary laboratories as a general guideline. This guideline fulfills the requirements for validation as defined for ISO 17025 and is accepted by the Dutch accreditation board.

The performance characteristics of a validated method are described in a validation report. It gives a good overview of the quality of the method and describes in detail the various performance characteristics. Based on the described performance characteristics, the conclusion is drawn whether a method is fit for its intended use. It is important to note that a method does not have to be perfect. One can compare with other methods available to conclude that, although not perfect, the validated method is the best available. Based on the validation report, one may also conclude that a method is not fit for purpose and either the scope has to be changed or further method development is required.

In practice

From 2008 until 2011, the National Reference Centre of the Dutch Plant Protection Organization and Naktuinbouw carried out a project to revalidate 37 existing and running tests for the detection and identification of quarantine organisms in plant material to a higher standard. Since the detection of quarantine organisms also requires an identification or conformation by a complementary method, a test consists of at least two methods. For 25 tests, one or more methods have been validated and have been shown to be fit for purpose. For 12 organisms, the validation has been postponed, since the results already indicated that the method did not fulfil the requirements defined. This result, though disappointing, is highly interesting. It shows that validation can give more insight into the quality of a method, and that you can ascertain if a method fulfills its requirements. For the 12 organisms, additional method development is required to improve the method to make it fit for purpose.

Conclusion

Quality of diagnostic tests for detection of plant pathogens becomes more and more important. Nowadays, validation has become an integral part of the development of a detection of identification method, and can be used as an important indicator for the quality of a test. Also, for existing methods, validation can be applied. It gives insight into the quality of a method, based on relevant specific performance characteristics. It allows one to determine if a method is fit for purpose. Although validation requires additional effort in the development of methods for the detection of plant pathogens, it will underpin the reliability of the method and trustworthy test results, which is a strong benefit both for official bodies like plant protection organizations and for the horticultural industry.

Oats, a cereal to love

Luud Gilissen, Jan Kamp, Ingrid van der Meer, René Smulders, Johan Vereijken and Alfons Jansman

Oats are increasingly recognized as a healthy cereal with proteins, starch, fatty acids and fibres all perfectly fitting to human needs and with good potential for the prevention of chronic diseases. Its soluble fibres reduce blood cholesterol and its protein is safe in cases of coeliac disease. Oats form a complete health package.

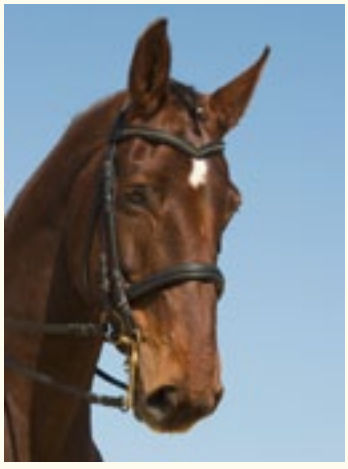
Up to 1960, the cultivation area of oats in the Netherlands was around 150,000 ha, but then it steeply dropped to only 1,500 ha in the 1980s. Worldwide, oat production was reduced by half in the same period to 25 million tonnes (equalling 2% of the total world grain production). One major reason for the steep decline was the mechanization of agriculture, replacing horses with tractors and making on-farm cultivation of oats as 'fuel' superfluous.
Another significant reason was the increasing interest in higher yielding crops, such as maize and winter-wheat. As a result, oats had become a neglected crop, with its treasures and potentials for applications in food, feed and field ignored. Mistakenly. Oats are now increasingly considered as healthy, nutritious and sustainable, and deserve a large-scale come back.

Oats for health

The oat grain contains a high amount of soluble fibres (beta glucans), up to 5% of the dry matter. These fibres are mainly present in the endosperm cell walls and form the major cell wall component. In the large intestine, these fibres play a positive role in stabilizing the micro-flora composition, which in its turn gives a boost to the proper functioning of the immune system. Oats is the only cereal that accumulates oil in the endosperm in significant amounts. The oil content can reach levels of 10% and higher; especially the naked oats are renowned for their high oil content. This oil has a high concentration of unsaturated fatty acids which may reduce the risk of coronary heart and vascular diseases.
The proteins of oats are easily digestible and are suited to the human need with regard to the content of essential (indispensable) amino acids. In this regard, oat protein is comparable to the protein

Not only humans

Gluten intolerance (coeliac disease) is a disorder that is not restricted to humans. It has been observed in dogs (mainly Irish Setters and Springer Spaniels) and this spring, even some Olympic dressage horses were diagnosed with it. Professor Chris Mulder of VU University Medical Centre, Amsterdam, the Netherlands, is a renowned specialist in human coeliac disease. When researchers at the Dutch Faculty of Veterinary Sciences of the University of Utrecht consulted him about some of their equine patients, he first believed they were pulling his leg. They claimed that some of the dressage horses that participated in the Olympic Games in Beijing, China, seemed to have a thickened small intestine. Was it conceivable that they were sensitive to the wheat they were fed as a supplement to their diet?



A collective research brought to light that the afflicted horses did indeed suffer from gluten intolerance. When fed a gluten-rich diet, they showed concurrent antibody responses. The level of tissue transglutaminase antibody or tTGA, an antibody against the enzyme that occurs in the intracellular vesicles in the endothelium of the small intestine after binding to specific parts of gluten proteins, increased. After six months of gluten-free diet, the blood antibody titres decreased, the symptoms of inflammation of the small intestine improved and the zest for work reappeared. Together with the veterinaries, the coeliac disease team of VU University Medical Centre has now started to develop a screening test aimed at identifying gluten-sensitivity in individual horses based on blood samples. As coeliac disease is hereditary, it is important to test stallions. In addition, the producers of concentrated feed are motivated to tackle the problem. Oats might therefore again become the major supplement to hay and pasture in the daily diet of horses.

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quality of pulses and rice, and can function to replace meat protein. In addition, it recently appeared that oat protein is safe for the vast majority of individuals suffering from gluten intolerance (coeliac disease), making oats for them an excellent alternative to wheat, rye and barley.

Oat starch is also special because of its low glycaemic index. Together with the fibres and the fats, this starch type causes a long-lasting feeling of satiety which may help to prevent or cure obesity.

In addition, oats are rich in vitamins and minerals, and its phenolic compounds, of which in particular the avenanthramides, have anti-oxidant activity and antiatherogenic and anti-inflammatory properties. In all, these components (micro- and macronutrients) make oats a beneficial and complete food product with unique potentials to reduce the risk of various chronic diseases.

An approved health claim is a valuable tool in the food industry to communicate with the consumer through product labelling and advertising. The specific health effect of a food or food component should be adequately substantiated and supported by unambiguous scientific data. In Europe, health claims are currently harmonized through new health claim directives, and the European Food Safety Authority (EFSA) is very strict in the scientific evidence that should support each claim. One of the few health claims approved by EFSA relates to the finding that beta-glucan fibres of oats reduce the blood serum cholesterol content. The potentials of oats and its compounds regarding diabetes, weight management, and immune-stimulation will be further elaborated in new health claim applications to be developed.

Oats as feed

Where oats are healthy for humans, it is also a venerable feed ingredient for all farm animal species, as de-hulled grains and, especially for ruminants, as entire plant (silage) and as hulled grains. Naked oats have a higher nutrient digestibility in pigs, poultry and ruminants than the hulled grains. However, oat hulls are functional as a feed ingredient to promote gut health and to induce satiety in fed-restricted animals such as gestating sows and pullets (young hens). For many centuries, oats have been known for their anti-diarrhoea effects and for the treatment of other intestinal diseases in pigs and piglets. A diet containing 20% oats significantly reduced increased liquid accumulation in the intestinal lumen under challenged conditions.

Further, mother-cows grazing on oats significantly increased the growth performance of their suckling calves. Oats also promote the health status of farm animals in critical phases, such as in early lactation cows and in calves with metabolic defects. Broilers (chicken kept for meat production) are vulnerable to reduced intestinal health. Functional ingredients

from oats do not only supply a valuable source of nutrients and energy, but also support the development of a healthy and well-functioning digestive system due to the presence of fermentable carbohydrates that balance the intestinal micro-biota and the immune system. In addition, such dietary support of gut health may also help to reduce the use of antibiotics in animal production systems. Finally, methane production, as the result of fermentation in ruminant guts, may significantly be reduced by feeding with high oil-containing oats.

Oats for sustainability

Oats is a robust crop that hardly requires additional input of nitrogen and other nutrients, and of weed and pest management. This makes its environmental impact low and its suitability to organic agriculture high. Oats also fit well in various crop rotations, where it increases soil fertility and reduces several serious soil-borne diseases. Breeding objectives relate to environmental factors, such as climate change and the sensitivity to lodging.
Naturally, increasing grain yield is important for its competitiveness, especially as feed crop. However, other breeding and research aims should include the level and functionality of health-promoting compounds, as this allows the marketing of oats and oat-derived products aiming at the general health status of humans. This certainly relates to the level of beta-glucans with their proven beneficial effects.

The Dutch Oat Chain

The first activities to refocus attention on oats in the Netherlands were based on recent findings that oats can be tolerated by individuals with coeliac disease (gluten intolerance). However, normal oat products from the supermarket are not safe for these people because of their contamination with gluten from wheat, barley and rye. Sources of contamination are present all along the production chain, from the sowing-seed, the cultivation field, the combines for harvest, the facilities for transport and storage, the processors like millers and bakers, to the food shops. Due to these multiple sources of contamination, oats were a suspect food for coeliacs.
Since 2005, Wageningen UR has been working successfully towards the establishment of the gluten-free oat production chain, under contract and control by a seed company and with full support from the Dutch Coeliac Society. The first products are now on the market: gluten-free breakfast oat products and a unique gluten-free pure-oat bread. From this initiative, the focus on oats as a healthy cereal was further extended and next to the gluten-free oat chain.
The Dutch Oat Chain was established in 2011 and is aimed at the large-scale come back of oats in Dutch agriculture as a healthy and nutritious food and feed, and sustainable in the field. Wageningen UR will, together with these companies and organisations, perform research activities and product innovations to give its original glamour back to oats and make them beloved again as never before.

More information: www.haver.wur.nl

EU prepares package of new seed legislation

John van Ruiten

In the autumn of 2012, the EU Commission is expected to launch a package of three draft proposals for legislation relevant to the seeds and young plant industry in the European Union. It is expected that the renewed EU-legislation will come into force around 2015.

In the package the EU Commission is preparing, there will be proposals for regulations on both 'quality of propagating material' and 'phytosanitary matters'. An impact assessment (an evaluation of the consequences of changing the legislation) has to complete the package. Also, a proposal to include these regulations under a horizontal 'control-regulation' will be made.

Better regulations

In 2008, the EU started a process of evaluation of the existing legislation on the marketing of seeds and plants. This legislation has been developed since 1966 and nowadays there are twelve so-called 'marketing directives', relevant for almost all agricultural, horticultural and forestry seeds/plants. In each directive, the EU has laid down requirements on safeguarding identity, quality and non-quarantine health aspects of propagating material including, labeling of marketed material. In the most recent directives (created in the 1990s) requirements for not only seeds and plants, but also for companies/nurseries were formulated, including the responsibility that professional operators have to uphold the quality status of the material that they produce and/or market themselves.

The evaluation has shown that, basically, stakeholders (industry, governments, growers' organizations) are generally satisfied with the result that EU legislation has had in the last 40 years in improving quality/identity of plant propagating material. There are some concerns about the sometimes complex and different ways in which in various crops both certification and variety registration are 'organized'. Another concern, as a result of the evaluation, is that differences exist in the implementation and the financing of the controls of all these directives in the 27 member states of the EU.

And finally, the EU questions itself if for specific crops (not widely grown in the EU) detailed legislation is necessary. The EU Services have developed a number (five) of possible scenarios for the new approach ranging from 'maintaining the present situation' to 'a strong liberalization of the market, shifting responsibilities from the government to the industry'. The proposal that is expected this autumn will most probably be a mixture of elements from the different scenarios.

The EU aims to propose a general 'seed law' to the member states in the form of a regulation (and not in the form of directives). In the EU, a regulation does not have to be included in the national legislations of individual member states, but a regulation is directly applicable and can (must) be implemented without any delay/changes.

A regulation is especially very helpful if the aim is to harmonize the execution of practical aspects of registration, certification, labeling, inspection and control. It is expected that the new seed law will focus on basic aspects and that specific crop requirements (for variety registration and criteria for certification) will be discussed later. Specifically interesting is how the so-called 'Kokopelli-case' (an EU court case in which the validity of obligatory variety registration in [amateur] vegetable varieties is judged) will work out in the new legislation proposals.

Plant health legislation

In 2009, the EU also started the process of modernization of the Common Plant Health Regime (directive 2000/29). This directive prescribes phytosanitary measures against the introduction and spread of harmful organisms within the EU. Inspections and plant passports requirements form the backbone of the marketing and movement of healthy seeds and plants.

In an evaluation in 2010, it became clear that there are some topics which need better and intensified attention if the EU wants to keep its territory free of certain pests and wants to diminish the spread of quarantine diseases.

The most important points mentioned in the evaluation were the plea for better and intensified import inspection procedures, better harmonized inspection protocols and trained inspectors, better monitoring and surveillance programs in order to detect possible outbreaks more quickly and take measures, harmonizing plant passports, a review of protected zones and more research and development of diagnostic tools. And, very significantly, the evaluation identified that incentives (for both companies and member states) should be developed to make 'the private industry' more responsible for phytosanitary issues and to further promote public-private partnerships.

John van Ruiten is Director of Naktuinbouw, the Netherlands

In 2008, the EU started a process of evaluation of the existing legislation on the marketing of seeds and plants

It is generally expected that the new draft 'phyto law' will be stricter on importing seeds/plants, especially from as yet unknown sources. It is also expected that the new legislation will regulate not only on quarantine organisms, but also RNQPs and serious quality pathogens (where the new seed law will probable focus mainly on aspects of identity and quality).
As serious quarantine pathogens can (more often) occur in many different species, there are some thoughts that plant passports should be required for propagating material of all species (and not only for selected species, as it is now). If the plant passport can be realized in the form of a 'statement/logo' on suppliers' documents, such a suggested broadening of the system will lead to better phytosanitary safeguards without leading to extra administrative costs.

Controls

A relatively new topic in the development of EU legislation is that the Commission aims to bring all regulatory aspects of supervision and control together into one horizontal 'control regulation'. Such a regulation already exists for animal feed, animal medicines and (human) food. This regulation is called '882' in EU terminology.
By creating a new control regulation, the EU will be able to identify what the responsibilities of every national 'designated authority' are (including annual planning of controls [priorities] and reporting results of controls). Also the conditions for delegating controls to 'official control bodies' and for carrying out 'certification under supervision' can be specified in this regulation.
Basically, the existing '882' regulation requires operators to have a quality (management) system in place, giving them the instrument to continuously identify that they (and their products) are fulfilling all legal requirements. The control authorities have to develop a so-called 'risk-based control plan'. It will be interesting to see if this idea will also be the 'backbone' of a new EU control regulation. Another very important item (for the industry) is that the EU Commission wants to come to a 'level playing field' both for the execution of inspections/tests/controls, but also for the financing of these control activities. It is expected that a proposal will be made that, basically, all costs for executing inspections/test/certification will have to be paid by the operators (companies). All 27 member states have to charge comparable costs (based on more or less prescribed formats) to the industry.

Autumn 2012

It is expected that the Commission will present its proposals to the EU Parliament and the EU Council of Ministers in October/November 2012. The whole process of discussions about the new proposals through to final adoption of the new legislation will probably take a minimum of two years. Therefore, new legislation is not expected before 2015.

Green vegetables thrive in water

Monique Krinkels

A more effective way to make use of the land, an optimal use of fertilisers, a more even growth, environmentally friendly - the many benefits of growing green vegetables floating on water sound convincing. For three years, Proeftuin Zwaagdijk has been testing this novel horticultural technique. Even for breeders it has advantages.

Refining horticultural techniques for green vegetables enabling an increase in production seemed to have reached the end of the line a few years ago. Until an 'outside-the-box' idea came up. If you cannot use land more efficiently, make use of an alternative: water. It has already proven to be highly advantageous for other products. Most Dutch tulip flowers are grown on water and the same goes for chicory. But for a long time it was out of reach for the outdoor growing of green vegetables.

Innovation

Improving cultivation techniques is an important part in the research carried out by Proeftuin Zwaagdijk, an agricultural research centre carrying out practical research in the Netherlands. Both internal and external researchers come with innovative ideas, and Proeftuin Zwaagdijk (literary translated 'trial garden', in the Dutch village of Zwaagdijk) tests whether they are applicable and sustainable.

"In 2007, Proeftuin Zwaagdijk started growing vegetables in outdoor gutters, but that was not a success. Crops, such as Chinese cabbage, that produce a huge mass of roots, tend to block the gutters. Suddenly, parts of the plants are left without water. Moreover, the wind is a harmful factor of importance", explains Johan Kos, managing director of Proeftuin Zwaagdijk. "Together with Wageningen University and Research centre, we started three years ago growing lettuce using the so-called Deep Flow Technique (DFT). So far, with satisfactory results."

Deep Flow Technique makes use of water basins. Young plants are placed in a styrofoam board that floats in a 35cm deep water basin. The roots drift freely in the water. The water contains the necessary nutrients. "During the past three years, it has never been necessary to refill the water, only the minerals the plants had used had to be replenished", adds Johan Kos. The system has been successfully tested with lettuce, iceberg lettuce, endives, Chinese cabbage, pak choi, Florence fennel, radicchio, parsley and blanched celery. Trials with cauliflower, broccoli, spinach and leek look promising, as do

Seed support

The experimental horticultural station in Zwaagdijk was started in 1986. Since 1990, the government has reduced funding for practical research. As a result, agricultural research was radically changed nationwide. Proeftuin Zwaagdijk was to be closed due to this reorganisation. The governing body of Proeftuin Zwaagdijk decided to continue from 1st January 1997 as an independent, private foundation. The company in Zwaagdijk is situated in the province of North Holland. There are 18 hectares of land (partly organic) of which 6,000 m² is glasshouse. Proeftuin Zwaagdijk also has 25 storage cells. In the Westland region, there are also 6,000 m² of glasshouse and additional areas for research and demonstration in the Demokwekerij Westland.

During recent years, the Proeftuin Zwaagdijk has developed into one of the most important agricultural research centres carrying out practical research in the Netherlands. The Proeftuin Zwaagdijk has a nationwide network with trials fields at 100 locations spread over the whole of the Netherlands.

For many years, Proeftuin Zwaagdijk has been active within the seed industry. The research organisation forms part of Seed Valley, the area between Enkhuizen and Warmenhuizen in North Holland. In this project, the companies work together in the topics of image, education and knowledge. In this area, tens of companies are located which are specialized in plant breeding, production and sales of high quality seeds and vegetable breeding material. Suppliers of services and machines specific to the seed sector also belong to this cooperation.

Among the services for seed companies is the lay out and maintenance of demonstration fields for open days, variety testing and germination testing, to establish the germinating capacity of seed lots, seed coatings, plant protection chemicals on seeds, cultivar value research, disease and crop protection research. Furthermore, the laboratories of Proeftuin Zwaagdijk can determine the number of usable plants, seed moisture and seed purity.

some flowers and perennials. Some vegetables can even germinate while floating on the water, such as lamb's lettuce and wild rocket.

Growers

The production increase in water basins is a huge leap forward for growers. "Take lettuce for instance: we can yield seven to eight times per year. For cauliflower, the yield is tripled. In soil, 25-30% of the iceberg lettuce plants do not reach maturity, whilst that is only 10% in water."
Another positive effect is that diseases are rare. "Mildew rarely occurs as the plants dry far more quickly on water than in soil. Furthermore, growing in water basins has the advantage that the quality of the soil and the weather conditions have become irrelevant. The plants do not have to compete with weeds, while the water forms a barrier for snails and slugs which they cannot bridge. And, of course, the plants stay cleaner as there are no mud spatters." However, it has no influence on other pests. Whether grown on water or in soil, aphids, caterpillars, cabbage root flies and flea beetles can attack the plants. It is also no safeguard against diseases such as Botrytis and Sclerotinia.
On the other hand, it is far easier to automate the process of growing and harvesting than with a culture in soil. The plants are mobile and can float wherever they are pushed or pulled. For instance, to a shed where workers can harvest the plants in comfortable, dry circumstances. "And, of course, it is beneficial for the environment, as there are no fertilizers added to the soil."
One of the growers in the area has started a large scale trial. Pater-Broersen has six basins of 900 m² each to grow lettuce. And successfully! In 2011, Pater-Broersen started as the first Dutch company with the production of various types of lettuce in outdoor water basins. Dick Pater believes water basins are the future. According to him, this method of growing is highly manageable and sustainable. It saves on labour, needs less plant protection chemicals and fertilizers, the CO_2-emmission is reduced, the use of water is limited, as superfluous rain water can be stored to be used in dryer periods, and last, but not least, the working environment is dramatically improved.

Selection

The technique is also a valuable tool for seed companies as it makes selection easier. "The plants grow far more evenly and, moreover, they come up much quicker. Furthermore, diseases are relatively rare."
But it also offers a new breeding goal. Not every variety grows as well in soil as in water. Johan Kos: "Especially in endives and cauliflower there are significant differences between varieties, but we have noticed it in other crops as well. Some varieties definitely have a far better start than others. The growing speed, evenness and yield percentage vary. Developing varieties adapted to floating in water might be a future breeding goal."

Criticism deserves serious attention from the EU Commission

Bart Kiewiet

In May 2010, the European Commission launched an evaluation of the CPVR Acquis (state of affairs). Taking into account that this system has been operational since mid-1995, this was certainly not an untimely initiative.

The evaluation of the Community Plant Variety Right (CPVR) Acquis resulted in a report that was presented to the EU Commission in April 2011. The main conclusions were quite positive: "the CPVR Acquis functions well and has met its objectives. In the opinion of the evaluator Stakeholders are generally content with the system." In the opinion of the evaluator, the primary strengths of the system are: the EU-wide coverage, the balance between the different interests involved, the incentive it creates to invest in the development of new plant varieties, the breeder's exemption and the duration of the right. But it is not all sunshine and flowers. The evaluator identifies some "areas of weakness... particularly the operation of the agricultural exemption and the ease with which rights' holders can enforce their rights." To cope with these and other weak points, the evaluator suggests some measures regarding:

– the organization of DUS testing;
– the enforcement in respect of essentially derived varieties (EDV's);
– the legislation as regards the use of farm saved seed of protected varieties; and
–the enforcement provisions in the Basic regulation.

Breeders satisfied

Where the European Seed Association (ESA) seems to agree with the tenor of the conclusions of the evaluation, CIOPORA shows a rather critical attitude in a document from 5 September 2011. I will give a short reaction to the most important points of criticism by CIOPORA. But first, some general remarks.

The reaction of CIOPORA to the evaluation is characterized by qualifications such as 'incomplete', 'unclear', 'too broad', 'too weak' and 'lack of...'. I could, in fact, not find one positive word in said document about the CPVR Acquis. The statistics of the CPVO demonstrate nevertheless that breeders, especially those belonging to the category organised by CIOPORA, have made and are still making use of the Community system on a large scale to protect their varieties. The sombre picture of the CPVR painted by CIOPORA apparently does not fully reflect the appreciation of the system by the users. CIOPORA expresses the view that "The Final Report provides an incomplete picture of the breeders' opinion about the CPVR Acquis." It furthermore states that "more than 60% of the holders of CPVR titles for ornamental and fruit varieties have been excluded from the evaluation." The absoluteness of this statement is surprising, since CIOPORA, representing an important number of breeders and right holders, has been given the opportunity to contribute to the evaluation, and made use of it. The fact that the evaluator did not attach sufficient weight to its observations, at least in the opinion of CIOPORA, is another matter.

Criticism

Now I come to the CIOPORA observations on specific provisions of the Basic Regulation. As this regulation, as far as its substantive part is concerned, is based on the 1991 act of the UPOV convention, I will in my comments consider whether the changes in the Community legislation desired by CIOPORA could be implemented without modification of the UPOV convention.

Incomplete scope of rights: CIOPORA wants the scope of the CPVR to be extended to the 'use' of 'protected material'. The meaning of 'use' as an additional act under the scope of the right is not very clear, since at least some of the acts actually under the scope of a CPVR, such as 'production', 'reproduction' and 'conditioning', could all be considered forms of 'use'. Also the meaning of 'protected material' is unclear. Should this also cover harvested material? If so, it might be in conflict with the UPOV convention, since harvested material falls only exceptionally under the scope of a PVR.

Too broad exhaustion rule: Whatever the merits of the arguments of CIOPORA to limit the exhaustion of protection, the relevant provision in the Basic Regulation is fully in line with the UPOV convention. The UPOV convention does not give an opening to deviate from it. This means, that this provision in the EU legislation can only be changed after a preceding modification of the UPOV convention.

Too weak provisional protection: In the opinion of CIOPORA, the "current weak provisional protection does not provide sufficient protection ... (it) only protects dishonest players in the business. Improving the provisional protection is a primary issue." Also here the wording is rather strong and does not

The former CPVO president, Bart Kiewiet, has founded Bart Kiewiet Consultancy and has joined Vondst Advocaten, Amsterdam, the Netherlands, in an 'Of Counsel' capacity.

Bart Kiewiet: 'The statistics of the CPVO demonstrate that breeders are still making use of the Community system on a large scale to protect their varieties'

reflect a balanced assessment of the situation. I am convinced that also honest players in the business profit from this provision. Whatever, the UPOV convention offers sufficient room to have a stronger type of provisional protection than now applicable under the CPVR.

Lack of effective protection of Harvested Material: CIOPORA is in favour of the granting of unlimited protection of harvested material. It considers the lack of such protection as one of the largest loopholes in the CPVR. This issue was extensively discussed during the diplomatic conference of 1991, which resulted in the adoption of the 1991 act of the UPOV convention. At that time, there was not sufficient support for this old and, in my opinion, not unreasonable request by CIOPORA. It might be clear though that the EU legislator can only modify the relevant provisions in the Basic Regulation after a similar modification in the UPOV convention.

Lack of protection of Processed Material: In the opinion of CIOPORA, products that are obtained directly from material of the protected variety must be protected directly and per se. The reason for this position is the increased import of processed material from vegetable, fruits and nuts in the EU. A further increase can be expected in the foreseeable future. I understand the concerns of CIOPORA. As the UPOV convention opens the possibility to extend protection to products directly made from harvested material, the EU legislator should carefully consider this wish of CIOPORA.

Clarification of the notion of 'EDV' and 'variety constituents': CIOPORA invites the EU legislator to clarify these notions. In my opinion, a more viable way would be to convince a national court in proceedings, where the interpretation of these notions is decisive for their outcome, to ask for a preliminary ruling from the European Court of Justice.

Conclusion

Although CIOPORA gave a rather one-sided reaction to the evaluation of the CPVR Acquis, the points raised by this organization require, in my opinion, serious attention from the EU Commission and the Administrative Council of the CPVO. Some of the wishes of CIOPORA can only be implemented after preceding modification of the UPOV convention.

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Even the best PBR laws can be improved

Judith de Roos

Plantum recognises that the European Regulation (EC) 2100/94 on Plant Breeders Rights (PBR) is one of the best PBR laws worldwide. Nonetheless, important opportunities for improvement are still possible. Plantum has only suggested improvements that are legally feasible under the Convention of UPOV 1991, which is necessary if we want to realise them in the near future.

An important issue for Plantum is the period of protection. In the European PBR system, it is possible to prolong the protection period to 30 years, instead of 25 years, for certain species. At the moment, the 30-year protection period is in place for trees and vines and also potatoes. There are good reasons to apply this extended protection period to more species. This is especially relevant for flower bulb species, such as tulips and lilies, but also for asparagus, onion, strawberry and some vegetatively multiplied pot plants, such as orchids and anthurium. For all these species, the effective period in which the right holder can enjoy his rights is seriously limited because it is necessary to protect the new varieties long before they are commercialised. This can be due to either the testing period, multiplication period or market introduction period or a combination thereof.

Recommendations

Some other recommendations are as follows:

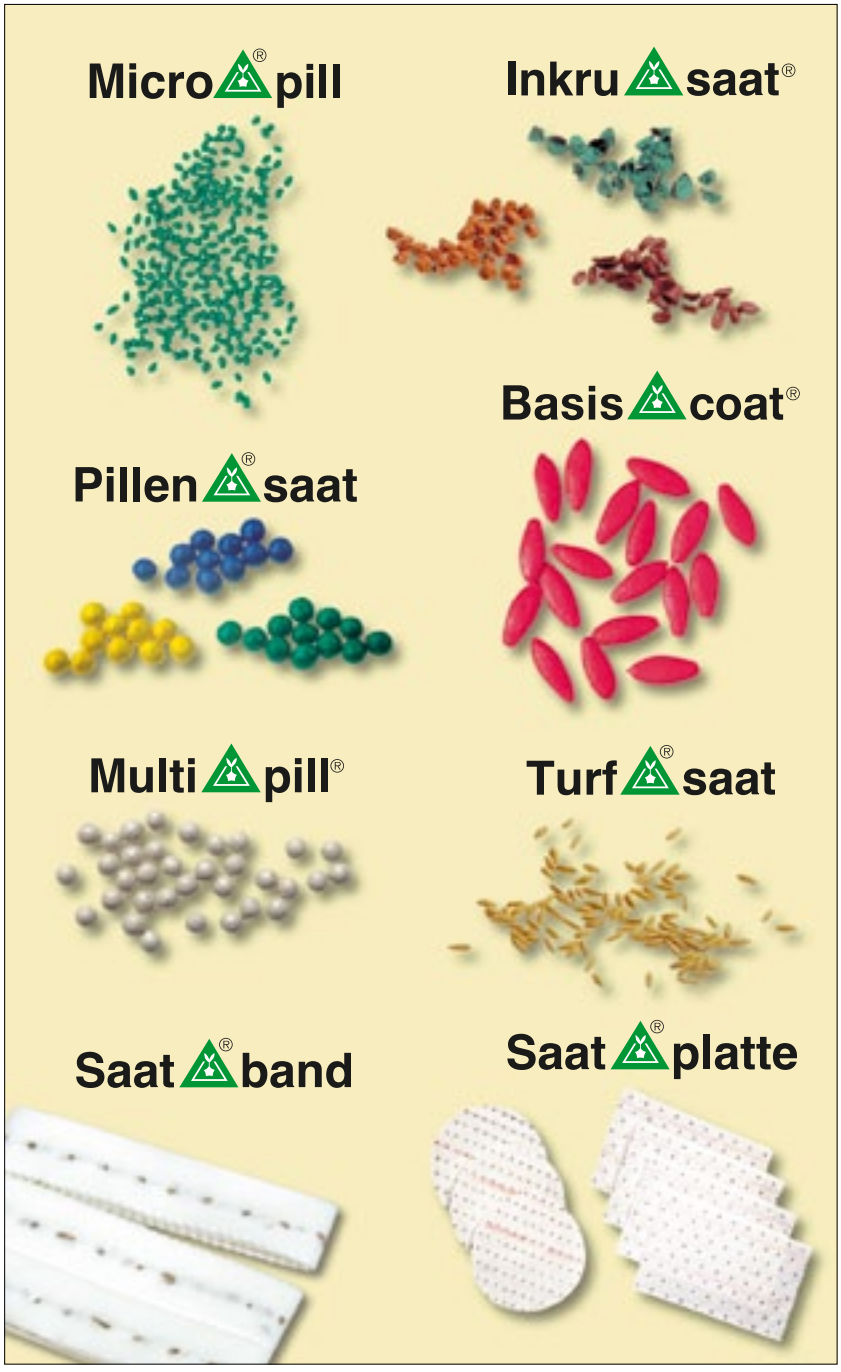
- The PBR right should include the transit of propagating material, which would mean that the right holder can act against the sales of plant material which originates from a country outside the EU, and is then sold through Europe (e.g. at a flower auction) to another country outside the EU.
- The right should be extended to products made directly from the harvested material.
- The definition of Essentially Derived Varieties (EDV's) should be rewritten, while remaining within the scope of the UPOV'91 Convention, in order to overcome certain differences of interpretation.
- With the current provision on Farm Saved Seed (FSS), the PBR-holder has absolutely no legal option to require the farmer to provide information about the use of FSS, and thus to pay a remuneration. It is therefore of utmost importance to introduce a legal obligation for the farmer to provide such information.
- To improve the opportunities to enforce one's rights, a general obligation should be implemented for all authorities, or other third parties that conduct activities on plant material of protected varieties, to inform the right holder with information about his varieties at his request.
- In each EU Member State, a centralised court should be installed that is specialised in all matters concerning PBR.

Input

Plantum has so far actively contributed to the evaluation of the Community Plant Variety Rights System. In response to the questionnaire for the stakeholders, different draft versions with answers were prepared. The different versions for the agricultural, vegetable and ornamental companies were essentially the same, but contained some specific focus points for the different species. Out of the 80 responses that were received from individual companies, around 60 responses came from Plantum members who either gave their own input or used the draft answers from Plantum. All points mentioned above will therefore be brought to the attention of the European Commission as a serious matter.

Judith de Roos is legal counsel at Plantum

Seed at its best



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Sugar beet	0.25 g/100,000 seed pellets
Sunflower	0.4 g/75,000 seeds

Monique Krinkels

In the past, dust resulting from improperly treated seeds inadvertently could spread an insecticide over neighbouring fields and crops. This may result in the death of honeybees in the surrounding area. In May, the European Seed Association, ESA, introduced the quality insurance system ESTA to prevent any such mishap.

European Seed Treatment Assurance

New quality system protects the environment

Two years ago, ESA started to develop a quality insurance system that shall guarantee that seeds are treated in a correct and safe way. Seed companies, seed treatment companies and producers of plant protection products worked hand in hand to develop effective, workable procedures. "The idea was to come to a system of process control. It is the only way to ascertain that the final product meets the standards the seed industry has established", says consultant Ruud Scheffer, who assisted ESA as project manager. "With ESTA, ESA presents a uniform protocol for the whole European Union."

Analyses

The use of seeds treated with insecticides is, in general, an environmentally friendly way to prevent the spread of harmful pests. A precondition is, however, that the treatment meets the quality standards. Analyses of a bee kill incident in 2008 highlighted that much can go wrong. It appeared that unusually high quantities of dust had been emitted into the environment during sowing, as a result of the abrasion of maize seed from batches which had not been correctly applied to the seed. The drift of the abraded material was amplified by the use of certain pneumatic maize-sowing machines that allowed the material to be dispersed into the air, as well as due to the dryness of the soil and strong winds during sowing, which dispersed the product in neighbouring fields frequented by bees. Beekeepers in the area reported that 50 to 100 per cent of their hives had been lost. "Correct application of the plant protection products is, therefore, important. The seeds should be cleaned thoroughly and sufficient glue should be added to prevent the forming of dust", explains Ruud Scheffer. But those are not the only measures seed companies should take. "ESTA is based on a solid quality management system, risk analysis, business specific requirements and the use of competent personnel. Furthermore, the system requires that the companies continually strive for improvement."

Trademark

The scheme is trademark protected and combines several elements such as a quality assurance charter (ESTA), a uniform testing protocol, recommendations for safe use labelling and information to users, as well as a logo that may be awarded to companies complying with the scheme and its standards, and are audited and accredited accordingly. Until now, several European countries, such as France and Germany, already had certification schemes. "The ESTA system fits seamlessly into those systems. If a country has additional requirements, it can simply be added", according to Ruud Scheffer. "We have started with maize and oil seed rape as these crops already are under some regulations in a number of countries." The certification will be audited by renowned certifying bodies, which'work is overseen by the accreditation authorities in the EU member states. "Provided that they have adequate experience in agriculture, as that is vital."

All information on ESTA is published on the ESA website: www.euroseeds.org.

Basal features ignored for too long

Geert-Jan de Klerk and Naser Askari

A century ago, tissue culture started off almost incidentally when Harrison was examining a problem in developmental biology. Today, tissue culture has become indispensable in many crops. Harrison considered tissue culture as a tool only and this approach has been followed ever since. Subsequently, knowledge of many essential features is completely lacking. This is a major obstacle for further practical development of plant tissue culture.

A century ago, both animal and plant scientists started experimentation on tissue culture: tissues were excised from plants and animals and cultured on an artificial nutrient medium. Tissue culture was first achieved for animal tissues. In 1907, Ross Harrison, working at John Hopkins University, published a short article that successfully introduced the new technique. His experiments were aimed at settling the dispute about how frog nerve fibres originate and for Harrison the development of the technique was actually irrelevant. For him, answering the biological question about the origin of nerve fibres was more important. Initially, the technique of tissue culture received much interest, especially from the public, because of its claim that human cells could live on forever in vitro and so human beings could in some way achieve immortality.

Around the same time, the plant biologist, Haberlandt, envisaged plant tissue culture. Several problems had to be solved. Contamination had to be dealt with, and adequate organic and inorganic nutrition and satisfactory exchange of gases (like O_2, CO_2 and ethylene) had to be achieved. Finally, to obtain growth of plant tissues, usually the plant hormones auxin and cytokinin are required and only after their discovery (auxin in the 1920s and cytokinin in the 1950s), did genuine tissue culture become feasible. From that time onwards, tissue culture rapidly developed into a major tool in agriculture and horticulture. The applications are in vegetative propagation (micropropagation), breeding (production of haploids, genetic engineering, conservation of genotypes, in vitro selection, mutagenesis) and plant pathology (elimination of pathogens).

In many crops, tissue culture has become indispensable and now the importance of tissue culture cannot be overestimated. At the same time, tissue culture was usually considered merely as a tool and understanding the essentials of tissue culture was largely overlooked. Here, we deal with such an essential feature, the internal transport of nutrients in plants during tissue culture, a topic that has hardly been considered in research but probably has a great impact on performance in tissue culture.

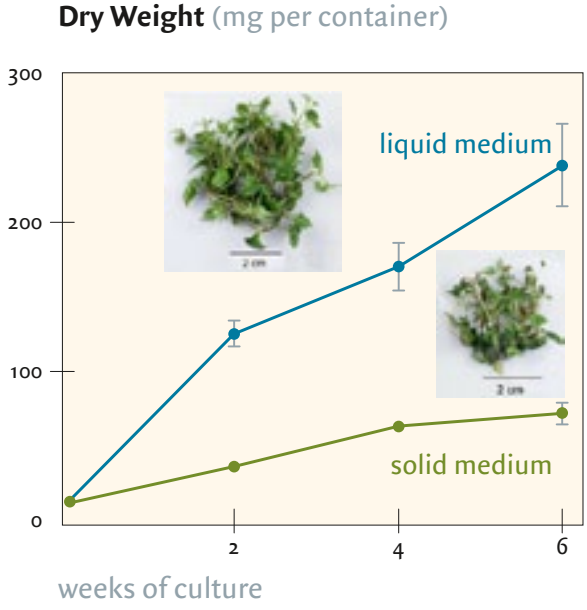

Figure 1. Growth of dahlia on solidified medium with agar and in a shallow layer of liquid medium. Growth on liquid medium is far larger because medium components are also taken up by leaves and thereby problems with transport within the plantlet are reduced.

Micro-environment

A major shortcoming - perhaps the main shortcoming - in tissue culture research is that adaptation of plants to the in vitro environment has not been examined. Why do plants have to adapt to the in vitro environment? As typical features of tissue culture, usually mixotrophy (plants have photosynthesis but they also use sucrose from the nutrient medium), incompleteness (e.g. in shoot cultures, the shoots have no roots), abundance of hormones in the medium and high relative humidity in the headspace are mentioned. These characteristics undoubtedly add strain to the adaptability of plants. The main adaptation though is probably an internal one and concerns the water flow in xylem and phloem. This will be discussed in the following paragraph.

In large multicellular organisms, transport systems are indispensable. Thus, higher animals have a blood system for transport of gases (O_2 and CO_2), nutrients, waste matter and hormones, and plants have xylem and phloem for transport of nutrients

Geert-Jan de Klerk and Naser Askari are researchers at Wageningen University and Research Centre, Wageningen, the Netherlands.

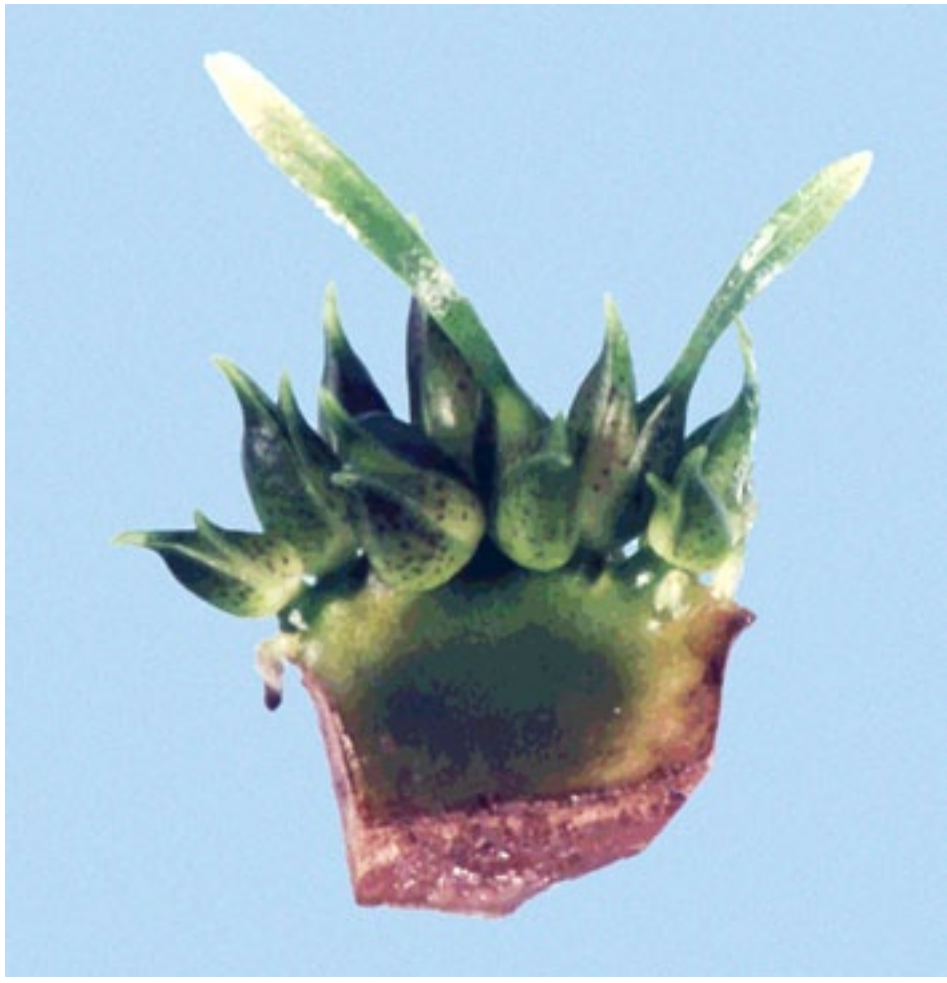

Figure 2. Lily bulblets regenerated on a scale fragment, 11 weeks after the start of tissue culture. Note that the surface of contact between the bulblets and the scale fragment is small (Φ 1-2 mm), which strongly reduces diffusion.

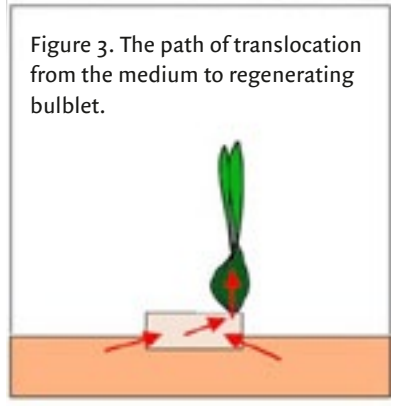

Figure 3. The path of translocation from the medium to regenerating bulblet.

and hormones. Water flow in the xylem is driven by transpiration of water from the leaves and water flow in the phloem is caused by differences in the osmotic potential between source and sink. These differences are brought about by uploading of sucrose in leaves, and sucrose unloading in the sink, viz. in growing tissues. The natural flows in xylem and phloem, and so also transport of solutes, are completely distorted in tissue culture. With regard to the xylem, in tissue culture transpiration is minimized because of the high relative humidity in the headspace. Moreover, the basal ends of cultured shoots and clusters are unlikely to have the same features as roots for taking up solutes. With regard to the phloem, the situation seems more problematic because in 'normal' plants, the phloem in the source is specialized (so called 'collection phloem') and the plant tissue that is stuck into the nutrient medium is unlikely to contain such phloem.

The dysfunctional xylem and phloem create great challenges for shoot cultures growing on solid medium, for example. Since in liquid medium (including temporary immersion bioreactors, TIB), medium components are also taken up by the leaves, transport problems are diminished and growth accordingly increased several fold (figure 1). From the commercial point of view, liquid medium and TIB are unsuitable alternatives for many crops as they have their own problems. Another way to improve growth is to increase the translocation to the growing tissues. In the next paragraph, this will be shown for the lily.

Lily tissue culture

Lily is conventionally propagated via scaling: scales taken from bulbs are kept in moistened vermiculite and, after some time, bulblets regenerate from the bottom of the scale. The regenerating bulblet is nurtured by reserves in the scale explant. Early in the history of tissue culture in the 1950s, this method was transferred to in vitro conditions (figure 2). When regenerated bulblets are separated from the scale and allowed to grow in tissue culture, growth is much less in comparison with bulblets still attached to the scale explant (figure 3). This indicates that the scale explant plays a major role in supplying medium components to the regenerating bulblets.

Because diffusion over long distances (> 0.5 cm) is slow (Fick's law of diffusion) and because the minimal diameter of the tissue through which diffusion occurs is small, diffusion will hardly contribute to the growth of regenerating bulblets. The nutrients must be translocated via the water flows in the vascular bundle, i.e. via xylem and/or phloem. The xylem is

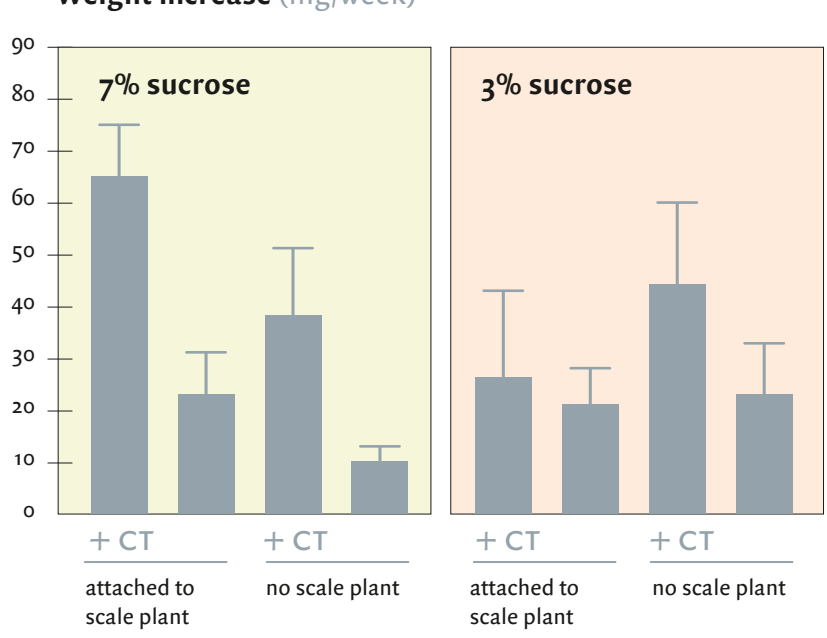

Figure 4. Growth of lily bulblets in tissue culture. The bulblets were either attached to a tiny scale fragment or not, and given a CT of 6 weeks at 4°C or not. Note that growth was enhanced by attachment to the scale, by a CT and by a higher level of sucrose. The CT influences growth via the explant but also has a direct effect on bulblets.

driven by transpiration from the stomata. We have observed some transpiration by bulblets (10 µl per day per bulblet weighing 100 mg), but this seems far too little to deliver sufficient sucrose. Translocation of inorganics via the xylem may be more important. So the phloem is the main supplier of organic nutrients.

Phloem transport is driven by differences in osmotic potential between source and sink, brought about by loading and unloading of sucrose, respectively. In addition to leaves, storage organs in which reserves are being broken down also act as source. Under normal conditions, reserves are broken down after a cold treatment (CT, a dormancy breaking treatment). The CT enhances the synthesis of hydrolytic enzymes like amylases and expectedly also increases the capacity to transport sucrose, so the loading into the phloem. With this in mind, we expected a positive effect of a CT on phloem loading in the explant and consequently on the growth of the regenerating bulblet. Figure 4 shows the effect of a CT on growth of isolated bulblets and bulblets attached to the scale explant. Growth was much higher after the CT when the scale fragment was present, especially at a high level of sucrose. It should be noted that the contribution of carbohydrates originating from reserves in the scale explant is negligible, as the scale explants were from tissue cultured bulblets and were, therefore, tiny.

The future

Tissue culture started off almost incidentally when Harrison was examining a problem in developmental biology. He considered tissue culture as a tool only and this attitude was widely followed: usually researchers still consider tissue culture merely as a tool. To use this tool successfully, one just needs minor modifications, usually in the hormonal composition, and perhaps one also has to have green fingers. At the same time, though, many crops perform poorly in tissue culture.

It is argued in this paper that research should deal with the essentials of tissue culture and that this may result in new tools. One such essential is the adapted transport within plants in tissue culture. In tissue culture the transport systems for long-distance transport, the natural water flows in xylem and phloem, are completely distorted. Nevertheless, shoots from many plants do grow in vitro, so their transport systems must function and the shoots have adapted so that medium components may reach the growing tissues in a plant in tissue culture. Research as to how plants have achieved this will provide the means to improve growth of genotypes that perform poorly.

Enjoying the touch of a flower petal

Monique Krinkels

The senses people use to get pleasure from ornamentals are usually smell and sight. But what if someone lacks one of these senses? Pieter, one of the volunteers of the Hortus Botanicus at the Free University in Amsterdam, demonstrates that we have more senses which we can use to enjoy nature. As he is blind, he focuses on touching, hearing and smelling plants.

Pieter: 'Intuition creates colour combinations that are in harmony'

"Cactuses can easily hurt you, but if you carefully strike the tips of the thorns you hear a soft strum. It sounds like music. Or smell the crushed leaves of a Crimson Bottlebrush, then you immediately know it is a close relative of the Eucalyptus. Really, sometimes I see more than a sighted person", explains Pieter.

Sensory tours

Pieter has been blind since the age of 17. Due to an error by an ophthalmologist, he lost his eyesight. Gone were his dreams about the future, gone were all his plans. He was just able to complete his floral design training, despite his rapidly worsening eyesight. But there it came to an end, because he could not find a job in the world of flowers. It took him 20 years to get over that blow. "But when I learned to accept the situation, the handicap started to help me. I started to make flower arrangements and corsages. People liked them and I was even asked to present a floral design course."

Pieter initiated the so-called sensory tours in the VU Hortus Botanicus. During these tours, he teaches the blind and visually impaired to experience nature in another way. "Some plants, for instance, have leaves that are warmer than others." There is enough to explore as there are over 10,000 species to be found in the Hortus. It has, for example, the largest collection of succulents in the Netherlands, especially Cactaceae, a large number of orchids, bambusoideae cultivars, terrestrial Bromeliaceae (Pitcairnioideae), a remarkable collection of epiphytical Tillandsia species and the only botanical Clivia collection in Europe.

By itself

Apart from guiding tours, Pieter also lends a hand in the daily care of the plants, putting small plants in pots to be sold in the Hortus shop. He cleans his hands to show some photographs. "My front garden, when I lived in Amsterdam. I designed it myself", he says. "People tend to stop and watch the wilderness and are, simultaneously, amazed at the balance. I just know which plant I want to have. My hands do what they must do and I trust they grab the right thing. They choose the colours they should choose. Intuition never fails. Intuition creates colour combinations that are in harmony." It is the same way in which he creates his floral designs. "As soon as I start to think, it does not work. I have to return to my hands, then it happens all by itself."

For a year, photographer Elsbeth Tijssen took photographs in the Hortus, while Hannah de Groot interviewed a number of volunteers. It resulted in the book 'Love at Work - Portrait of a Botanical Garden'. The book (in Dutch and English) is published by VU University Press, ISBN 978 90 8659 607 2 and costs 24.95 euro. More information: www.vu-uitgeverij.nl.

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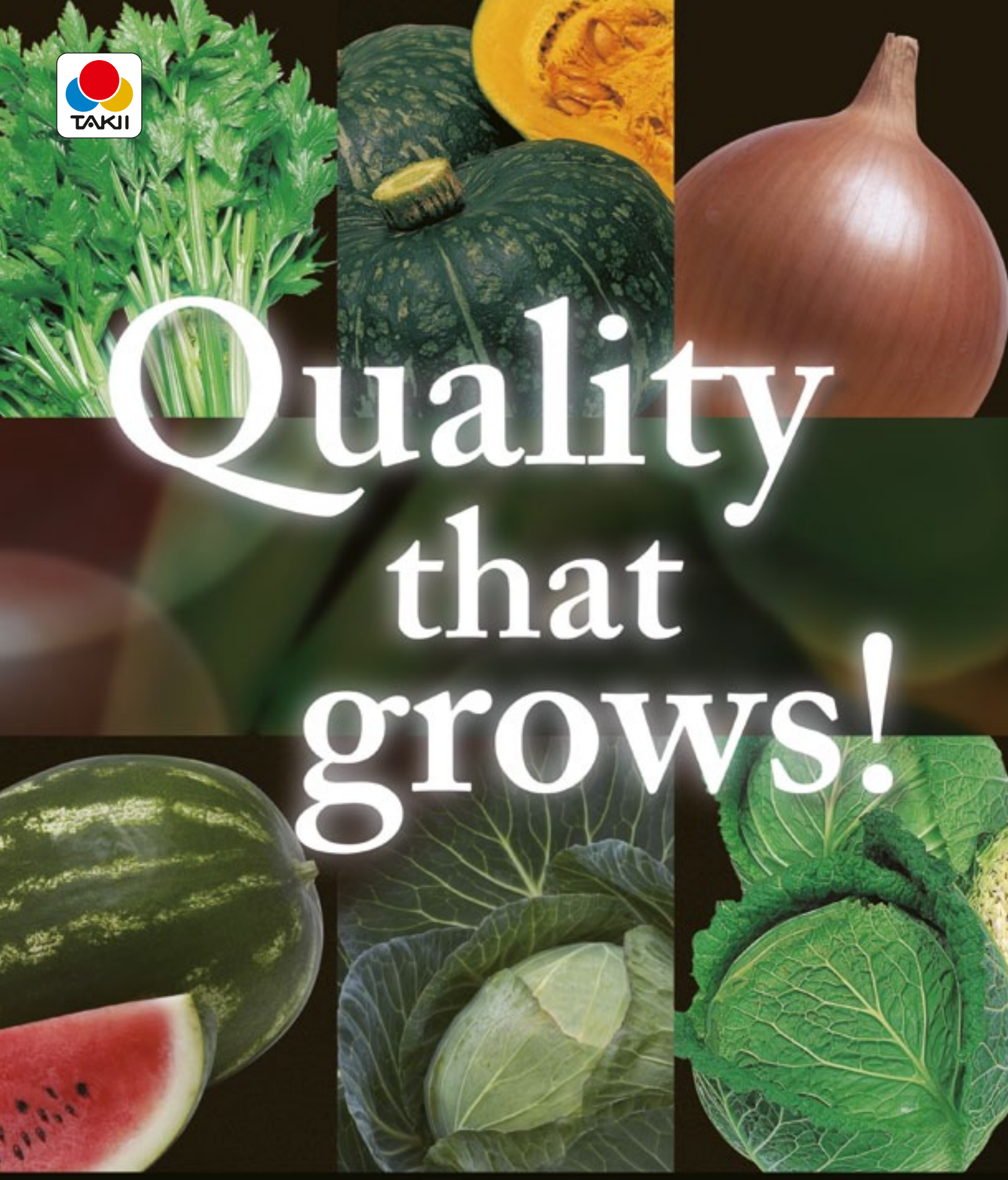

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