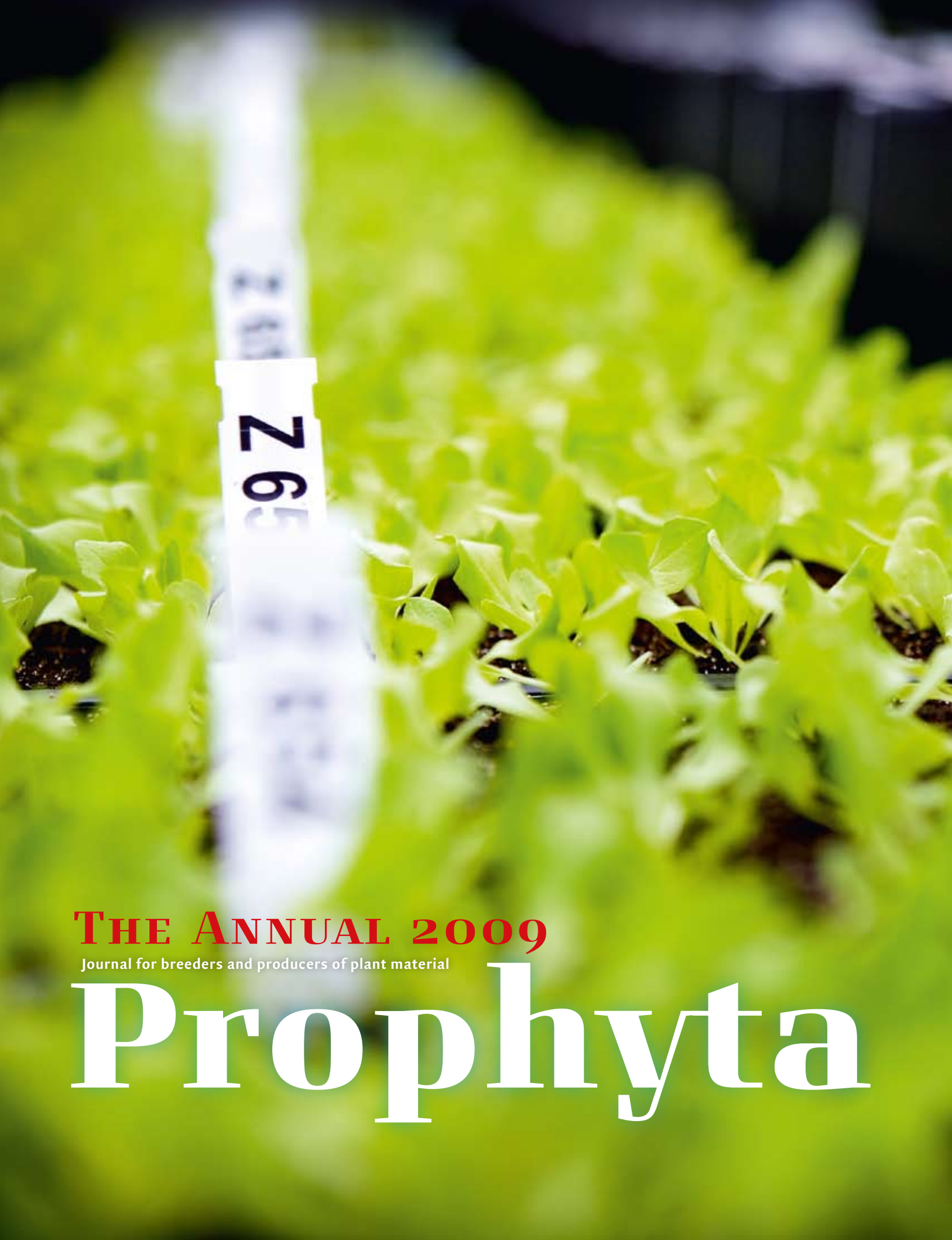

THE ANNUAL 2009

Journal for breeders and producers of plant material

Prophyta







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Contents

Fleuroselect judges award three medal winners

Fleuroselect has announced their 2010 gold medal winners. They are the Gaillardia x grandiflora 'Mesa Yellow' of Ball Horticulture Co., Physostegia virginiana 'Crystal Peak' of Ernst Benary Samenzucht and Sanvitalia speciosa 'Million Suns' of Dittmar Samen und Pflanzen. Over the last 12 months, the organisation has been expanding its activities. During the second European Ornamental YPP Convention in November, 65 participants representing 40 young plant companies agreed to unite as a European group under the Fleuroselect umbrella. According to Frank Hüdepohl of Bruno Nebelung, a member of the steering group, the conclusion was clear: "There is a definite need for a platform for companies in this sector at European level. At national level organizations exist, but an arena to network, share experiences and develop strategies at a European level is lacking."

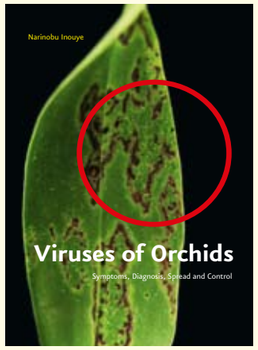
1 The Fleuroselect Gold Medal 2010 for innovation in breeding goes to Gaillardia x grandiflora 'Mesa Yellow'. Like the flat-topped mountains (mesas) after which it is named, this first commercial-quality, yellow Gaillardia from seed is a native of the southern United States. In common with the flat peaks, 'Mesa Yellow' has a uniform, regular, even appearance. The variety particularly impressed the Fleuroselect judges with its beauty and abundance of perfect, novel, yellow flowers. Add an excellent garden performance and a long flowering season and 'Mesa Yellow' is a truly worthy winner.

2 Fleuroselect has awarded its prestigious Gold Medal for excellence in breeding and beauty to Physostegia virginiana 'Crystal Peak'. This eye-catching new cultivar fits into the popular, modern range of annual flowering container perennials, which has brought traditional perennials to a wider market. 'Crystal Peak' demonstrated outstanding compactness and uniformity in both pack and garden trials and the judges were particularly impressed with its earliness. The sparkling white peak of perfect flowers was impressive all season long and will be a treat for the container market.

3 The 2010 Fleuroselect Gold Medal recognising exceptional developments in ornamental breeding has been won by Sanvitalia speciosa 'Million Suns'. This new cultivar shone out as a real winner with its abundance of perfectly formed, golden yellow flowers. The Fleuroselect judges found that the variety showed exceptional compactness, excellent basal branching and a longer flowering period, with an impressive season from May to the first frosts. It was judged to be an overall superior product for both growers and consumers alike.

Orchid book helps growers recognise viruses

The orchid book by Professor Narinobu Inouye is now available in English and Dutch. The book was originally published in Japanese only. 'Viruses of Orchids, Symptoms, Diagnosis, Spread and Control' helps growers to recognise infected orchids. Many viruses are known to infect orchids. First records of studied virus infections go back to the 1940s.



The book describes more than 40 viruses, of which the most important are: Cymbidium mosaic virus (vector mechanical), Odontoglossum ringspot virus (vector mechanical), Cucumber mosaic virus (vector aphids), Orchid Fleck virus (vector mites), Dendrobium mosaic virus (vector aphids) and Tomato spotted wilt virus (vector thrips). For each virus, the species of orchid in which they have been identified is recorded, as well as the symptoms that occur. The book is very well documented with 200 detailed photographs. The relevant test techniques (serological, indicator plants) are given for each virus. Methods of virus prevention, hygiene and other health management measures (vector control) are also described.
Professor Narinobu Inouye is renowned worldwide as an expert on orchid virus diseases and has been studying this subject for over 40 years. He has collected a unique database of pictures, most of them his own photographs, and has described comprehensively all aspects of virus diseases.
The book can be obtained by sending an email to: info@blue-birdpublishers.com. The price is 39.95 euro, excluding postage and handling charge of 10 euro.

Germany bans Bt-maize

Just before the start of the sowing season, Germany has banned the Bt-maize MON810. The minister of agriculture, Ilse Aigner, invoked the safeguard clause in the European legislation that allows individual countries to veto the EU approval of a transgenic variety. Previously, Austria, France, Greece, Hungary and Luxembourg have kept MON810 out of their country. The reason the German minister gave was that the maize was a danger to the environment, as it harms ladybirds, amongst others. According to the press release, the approval is suspended with immediate effect.
Any cultivation or sale of MON810 has been prohibited with effect from April 14th. The Bt-toxin protects MON810 against the European corn borer, Ostrinia nubilalis. Last year 4,000 hectares of transgenic maize were grown in Germany. Farmers in the region of Brandenburg, north-west of Berlin, were shocked by the measures of the German government. In this poor, sparsely populated area, they had hoped to revive agriculture by producing high quality maize. If they choose another non-transgenic variety, they will be forced to spray with insecticides that are known to be environmentally harmful. According to German newspapers, it is believed that the decision by Ilse Aigner is based on political considerations. She is a representative of the conservative party, CSU, which is widely supported in Bavaria, a region with a strong opposition to genetic modification. And European elections are due to be held in June. Monsanto has announced it will take legal action. German sources claim the damage could be as high as 6 or 7 million euros. According to European legislation, the member countries may temporarily prohibit transgenic crops only if there are reasonable grounds to believe that a GMO presents a risk to human health or the environment. That should have become clear from new or additional information. The German agricultural minister could, however, not confirm on what scientific evidence she has based her decision. According to her colleague, Annette Schavan, minister of science, studies by the European Food Authorities proved that MON810 is harmless.

Close cooperation

A few years ago, European tomato growers found wilting plants in their greenhouses. It soon became apparent that the dreaded bacterium Clavibacter michiganensis subsp. michiganensis (Cmm), had infected their tomato plants. It was a tremendous blow to these growers, as it is one of the most destructive tomato diseases. The problem with Cmm is that this bacterium is extremely contagious, can be transmitted in many different ways, is able to survive under normally unfavourable conditions such as on dry material, has a long incubation period and last, but not least, is very hard to detect in seeds, as even minute amounts can cause a breakout. Moreover, the bacterium grows so slowly that other bacteria could mask its presence. Therefore, it is very hard to control the spread of the disease.
It is not the first time, nor will it be the last, that horticulture has been confronted with a calamity. What could easily have become a footnote in the history of horticulture seems, however, to be developing into a brand new chapter. The Dutch and French seed industries, transplant producers, seed associations of both countries, and inspection organisations started a non-competitive project together to monitor plant health. Under the name Clean Seed, Clean Plant, hygiene protocols for every stage of production are being developed. From seed propagation to the production of transplants, grafting and tomato production, hygiene measures will be prescribed. Companies that adopt the protocol will be audited and, if accredited, will be allowed to use the Clean Seed, Clean Plant logo. Cmm in tomato is not the only target of the new approach, as others will follow in due course.
It is not the first time that the outbreak of a disease leads to positive results. In the early 1990s, the outbreak of another disease led to the start of the International Seed Health Initiative, ISHI-veg. At the time, a discussion arose about testing methods, as the results in one laboratory seemed to differ from that in another. It started in the same way, as a Dutch-French project, but soon seed companies in the USA, Japan and Israel joined the effort. Only two or three years later, ISHI-veg came to represent 70% of the world trade in vegetable seed for the professional market.
In the case of ISHI-veg, 'only' the seed companies, the inspection services and the international organisations had to put their shoulders to the wheel. In the case of Clean Seed, Clean Plant, many more parties will be involved. That will make it difficult to unite everyone in this project. However, it will be to everyone's advantage that as many companies as possible adhere to the new protocols. Let's hope that Clean Seed, Clean Plant will have similar success.

Monique Krinkels

Naktuinbouw opens Variety Center

With a new 9,000 square metre greenhouse, new office facilities and a photo studio, Naktuinbouw is now fully equipped for the DUS tests it carries out for the national Board for Plant Varieties and the Community Plant Variety Office (CPVO). The Netherlands Inspection Service for Horticulture in Roelofarendsveen receives 2,000 applications for plant breeder's rights each year. Apart from DUS-tests, the facilities are used for the phytosanitary import and export inspections for which the organisation has taken over responsibility from the Plant Protection Service of the Netherlands. The official opening on April 1st was carried out by Annemie Burger, director-general of the Ministry of Agriculture, Bart Kiewiet, president of the Community Plant Variety Office and Lous van Vloten-Doting, president of the Dutch Board for Plant Varieties. The threesome pushed the red button and with a spectacular big bang, confetti showered on the guests. Inside the facilities, there were several booths displaying the expertise of Naktuinbouw. There were, for instance, cucumbers of different varieties, showing how the appearance of a cucumber can vary. The plant doctor demonstrated how plant diseases can be recognised and even scary insects, such as gigantic cockroaches and arthropod, such as scorpions and spiders, found in imported plants were exhibited.

Software billionaire finances agricultural research

The Bill and Melinda Gates Foundation will finance agricultural research projects that address drought, pests, disease and other serious problems facing small farmers and their families who rely on their crops for their food and income. The foundation has donated 24 million US dollars to the programme named BREAD, an acronym for Basic Research to Enable Agricultural Development. The same amount has been made available by the US National Science Foundation. The NSF fund will be used to support research projects carried out by US-based institutions. The Gates Foundation, on the other hand, will award its funds to international partners via 'sub-awards from the US awardees'. "This partnership with NSF is an exciting opportunity to tap into the most innovative, transformative ideas the global scientific community can offer", said Rob Horsch, deputy director of the agricultural development initiative at the Bill & Melinda Gates Foundation. "We believe the time is right to increase our investments in scientific research with the potential to create new pathways out of poverty for the millions of smallholder farmers in the developing world who support their families on less than 1 US dollar a day." BREAD Program solicitations will be non-prescriptive, inviting a broad scope of applications. A solicitation for funding proposals under the BREAD program will be available in early June on the BREAD web site, which will be accessible through www.nsf.gov.

Support our initiative

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.nl
The Foundation primarily works with volunteers, but in order to recover costs for these activities we need advertisers for our annual magazine and/or direct financial support to the Prophyta Foundation.

We greatly acknowledge the companies mentioned underneath for supporting Prophyta, by either advertising or donating.

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Van de Bilt Zaden en Vlas	Sluiskil, the Netherlands	www.vandebiltzadenvlas.com	Agricultural seeds

Please feel free to contact our secretariat (P.O. Box 40, 2370 AA Roelofarendsveen, the Netherlands, email: info@prophyta.nl) to join membership of our distinguished group of agricultural and horticultural companies, both for further information or for donations.

Turkey bridges the gap between East and West

Hajo Strik

The decision of the International Seed Federation to organise the annual congress in Turkey could not be better timed. Turkey is a very rapidly growing economy in agriculture and horticulture and the decision to admit Turkey to the European Union is high on the political agenda. The country is proud of being the bridge between Asia and Europe and the cultures and civilizations of the East and the West.

It is the first time the Turkish seed association, TURKTED, is participating in such a large worldwide event. "From the start, we have collaborated successfully with the ISF Secretariat and they guided and helped us significantly", says Dr. Mete Kömeağaç, President of TURKTED. "Even if it is rather challenging to be part of such an organization, I could say that it is rewarding and, in the end, it will be well worth the effort for everyone." As usual, the crop sections and committees will continue to focus on their specific subject matters and follow their regular agendas. "However, there are some prominent issues that draw great attention from the participants. Among the major ones are the phytosanitary regulations and plant quarantine, seed treatment and environment and plant variety protection, plant breeders' rights and royalty collections, as well as seed trade."

Important event

Dr. Mete Kömeağaç is in his second term as president of TURKTED and has already held the post for four years. After graduating from an agricultural college, he started to work for a seed company as production unit manager. Later, he founded his own agricultural seed company. "Apart from producing and distributing seeds of our own varieties in some agronomic crops, we are also sub-contractors for other companies for whom we produce and process maize and sunflower seeds. Recently, we have established a seed processing unit and are focusing more on research." He is proud to be the host for such an important event. "I should also add that it will be a pleasure to receive all the guests coming from different parts of the world and try to treat them to the traditional Turkish hospitality. Besides their usual business interests and trade talks, I hope our guests may find an opportunity to enjoy the historical and natural beauties of Antalya."
And elaborating on the congress: "The seed industry is globally experiencing momentous changes with regard to trade, technology and regulations and the competition in seed business is increasing year after year. Considering the very dynamic nature of this sector, regular and more frequent contacts between companies and individuals are required. It has been almost a year since the Prague Congress and the agendas concerning the seed sector need to be updated. I think it will be beneficial for all of us to come together with the purpose of exchanging information and sharing views with regard to the various issues and developments in the seed industry. I believe this ISF Congress will bring many new opportunities to the Turkish seed sector."
He hopes that he may welcome 1,500 guests at the world seed congress. "But it is difficult to estimate the number of participants at this moment (in March, editor). I hope that registrations will soon reach the maximum number possible."

Mete Kömeağaç, President of TURKTED: 'The seed industry is globally experiencing momentous changes with regard to trade, technology and regulations and the competition in seed business is increasing year after year'

TURKTED

The Turkish seed association TURKTED was established in 1986 and has 87 member companies, who produce 90% of the total annual turnover of seeds. The organisation has been an ISF member since 1998 and it joined the European Seed Association in 2006. Along with its elected bodies and secretariat, TURKTED has five Working Groups: cereals and pulses, vegetables, forages and amenity grasses, industrial crops and biotechnology. They meet at least once a year and discuss the major seed industry related problems and make recommendations to the board of directors. In addition, there are ad hoc committees composed of company representatives who work in particular product lines. These committees regularly assess the situation with respect to the subject matters in hand and propose alternative actions. TURKTED plays an important role in Turkey's adaptation process to the EU, especially in aligning the seed legislation with that of the EU. The question is not whether Turkey will become part of the European Union, but when the country will join the EU member countries. "Accession to the EU markets will bring new challenges as well as opportunities for the Turkish seed industry. It is a relatively young and less developed sector, especially in some areas such as private research capacity and variety development. However, existence of both a favourable crop production environment and experienced companies in Turkey allow high quality seed production in some field crops. A further collaboration between local and EU seed companies might be developed. It is generally expected that the expansion of seed markets will have mutual beneficial effects for Turkish as well as EU seed companies. On the other hand, when Turkey eventually joins the EU, the Turkish production agriculture in general is expected to face strong competition from the EU, especially in some agronomic crop and livestock products."

Since 5600 B.C grapes are grown on the slopes of Mount Ararat. The Old Testament names the mountain where Noah's ark finally came to rest after the great flood as the first place were wine was produced. It is a compelling thought as it is near the Taurus Mountains where vines (Vitis vinifera sylvestris) grow wild

Turkey

Agriculture is a very important activity in Turkey. About 40% of the labour force is engaged in agriculture, which uses approximately 29 million hectares or 38% of the land. The country has a population of over 70 million people and Turkey's fertile soil and climate make the country one of the few in the world that is self-sufficient in terms of food. Turkey's great variety of microclimates and adequate rainfall allow for a broad range of crops. Farming is conducted throughout the country, although it is less common in the mountainous eastern regions, where animal husbandry is the principal activity. Large farms are concentrated mainly in the Konya, Adana and Izmir regions.

Huge country

Turkey is a huge country in comparison to many European countries. It has diverse climates and crop-growing conditions. As a consequence, there are large differences between the geographical regions. Agriculture and horticulture in the eastern provinces differ from that in the western regions. "Intensive arable crop production is widespread, especially in the western and southern coasts of Turkey", says Dr. Mete Kömeağaç. "The semi-arid climate in central Anatolia brings some limitations to the crop production. The climate and soil conditions

Agricultural crops production (x 1,000)

Wheat	17,782,000
Sugar beets	15,488,332
Barley	5,923,000
Maize	4,274,000
Potatoes	4,196,522
Cotton	1,820,000
Sunflower	922,000
Dry pulses	855,354
Rice	753,325
Rye	246,521

Vegetable crops

Tomatoes	10,985,355
Watermelon	4,002,285
Onion	2,007,118
Pepper	1,796,177
Melon	1,749,935
Cucumber	1,678,774
Aubergine	813,686
Legumes	769,144
Cabbage	673,152
Carrots	591,538

Fruits

Grapes	3,918,442
Apple	2,504,494
Olive	1,464,248
Oranges	1,427,156
Hazelnuts	800,791
Mandarin	756,473
Apricot	716,415
Lemon	672,452
Peaches	551,906
Pear	355,476

TurkStat, Turkish Statistical Institute 2008

are mostly suitable for range-based livestock husbandry in the cooler eastern Anatolia. Similarly, the forest and fruit trees dominate the northern coasts of the Anatolian peninsula, where arable agriculture is limited." Seed production is carried out in several parts of the country, depending on the species involved and the prevailing climatic and geographic conditions. In the eastern and northern parts of the country, no seed is produced because of the short growing season and high humidity. The bulk of the agricultural and vegetable seeds are produced in central, western and southern Anatolia, where both ecological and economic conditions are highly suitable. The dry and mild summers, along with the irrigation possibilities in many localities in the latter regions, enables quality seed production in maize, sunflower and cotton. Turkey produces a considerable amount of seeds in several crops each year, not only for domestic use but for export markets too.

Net importer

"Turkey is a net importer of seeds", explains Ayhan Elçi, secretary general of TURKTED. "The total seed imports have fluctuated lately around US$ 100-130 million and vegetable seeds constitute a major portion (approximately 55-60%) of that." Turkey imports both commercial/certified seed and stock seed in various agronomic and vegetable crops. The recent average annual monetary value of seed exports, which largely consists of maize, sunflower and cotton, is around US$ 40-50 million. "Presently, hybrid maize and sunflower seed constitute the two major export items. The high quality hybrid maize and sunflower seed produced in Turkey is preferred by foreign buyers", he adds. Since the late 1990s, domestic cotton seed has also gained momentum, where an increasing export trend is evident. "Although not significantly, the vegetable seed exports also showed some increases in recent years." Though increasing trends are apparent in both seed import and export, the import growth rate is higher than the export growth rate. The major export destination for seeds are the Netherlands, Spain, France, Italy, Russia, Ukraine, Bulgaria and Greece, while Turkey imports seeds largely from the USA, the Netherlands, France, Italy, Denmark, Spain, Israel, China, Chile and Ukraine.

Seed production

Turkey uses large amounts of agricultural and vegetable seeds for planting each year. The major agronomic crops are wheat, barley, maize, cotton, forages, sunflower, sugar beet, potato and paddy rice. "Though in industrial crops, almost a hundred percent is certified seeds, farm-saved seed constitutes an important proportion in winter cereals, pulses and some forage crops. However, the certified seed use in winter cereals and forages is increasing lately", says Ayhan Elçi. In addition, the country is one of the largest open field vegetable producers in the world and it has great production capacity in protected culture. Turkey's total annual turnover of commercial planting seed is currently estimated to be around US$ 375 million and it is continuing to rise. "This sum is divided almost evenly among the three groups of crops; i.e. vegetables, winter cereals and the other agronomic crops." Turkey is a major producer in several agronomic crops, fruit and vegetables. The arable crop production is primarily made up of cereals, pulses, industrial crops, and vegetables. Winter cereals occupy more than half of the cultivated land and almost 50% of the total national output comes from the agronomic crops. "Apart from various temperate fruit and nut crops, the country is one of the leading producers of vegetables. Each year around one million hectares of land is allocated to vegetable production." The most important produce are tomatoes which represents almost one third of the overall vegetable production. Watermelons, melons, and cucumbers-gherkins are the other important ones. Ornamental plant production constitutes only a small fraction of total agricultural output. The two major categories in this respect are nursery crops and cut flowers. One third of the ornamental plant production is carried out under protected culture conditions.

The balance is upset, but only temporarily

Monique Krinkels

Only two years ago farmers seemed finally able to relax. The prices on the world market at long last had reached a level at which producing became truly profitable. Today, the aftermath of the financial crisis has hit the economies around the globe. Rabobank director Dirk Jan Kennes and Cindy van Rijswick, explain the consequences of the financial depression on agriculture and horticulture.

Most laypeople did not see it coming at all. In August 2008, the general public happily sent their savings to Iceland to earn what, at the time, was believed to be a fair return on their capital. Since then, the world has changed massively: banks go bankrupt if they do not receive huge financial injections, companies have to dismiss their workers as the public does not dare to buy consumer goods, businesses are not able to invest as banks are wary to give out loans and politicians seem to have only a vague notion of how to cope with the depression that seems to be at least as serious as the infamous one of the 1920s. Is the future as bleak for agricultural and horticultural companies?

Commodities

Concerning the commodities, Dirk Jan Kennes, director of farm inputs, commodities, feed and animal protein at Rabobank International, is cautiously optimistic. For the present season, he expects a decline in planting, and farmers will hesitate to acquire the necessary farm inputs such as seeds, fertilizers and plant protection chemicals. They will probably need to invest more of their own working capital in the crops. "But the overall picture does not change. The upcoming markets will create an increasing demand and the political wish to exchange petrochemicals for biofuels will promote grain and oilseed crops", he believes. "Changes in price direction are driven by supply and demand", Dirk Jan Kennes continues. "First, let me explain the high prices since 2006. There are three major industries dependent on commodity production: food, feed and biofuels. The supply depends on the acreage designed for agricultural production and the yield per hectare." The latter is influenced by farm management, but also by weather conditions. For years, the stocks have been dwindling as consumption outperformed production. During the past forty years, real term food prices have remained low, which did not stimulate research and development. Slower growth in crop yields decelerated down wheat production from 2.6% in the 1970-1990 period and to 0.6% in the 1991-2007 period. The CAP-reforms in Europe shifted focus from production-driven support to direct income support (not linked to production), resulting in diminished intervention stocks. At the same time, harvests failed due to, for instance, droughts in Australia, but also in Russia and Ukraine the harvest was disappointing. In 2006, commodity stocks reached a point below the 'alarm-bells-ringing' danger level.

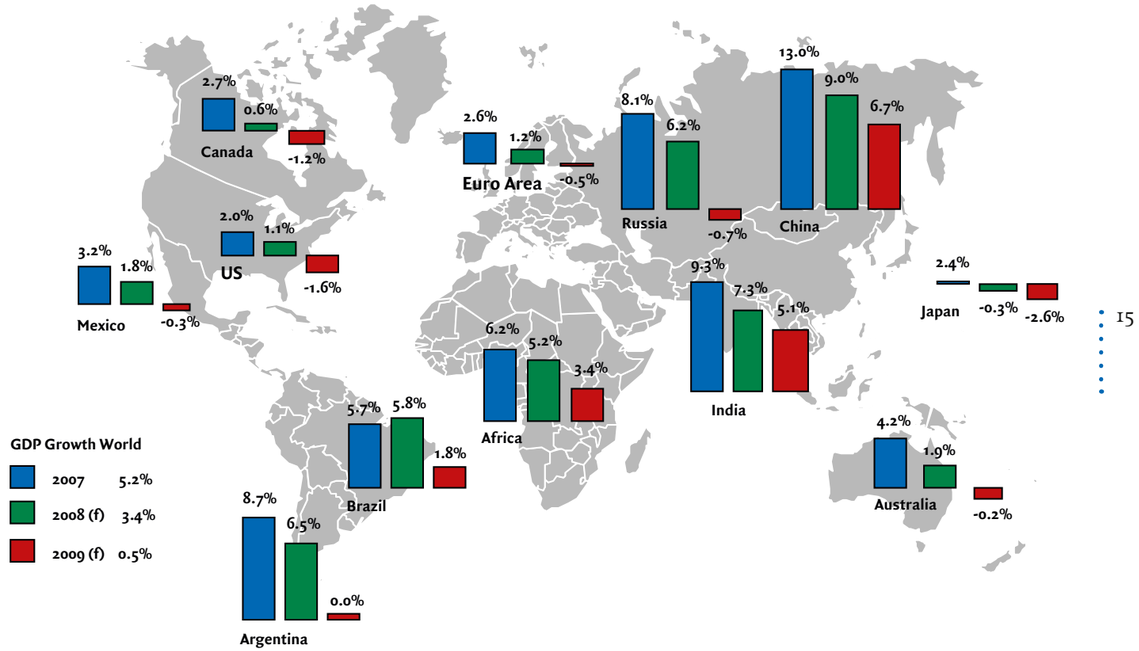
'Prices have changed so much for what we sell and buy that it is almost impossible to feel confident with the decisions we make'

Meat and feed

"On the demand-side on the other hand, the level was never that high. Consumers, particularly in India and China, expanded their daily menu with meat. That influenced grain and oilseed demand, because 3.5 kilos of feed is required for 1 kilo of pork, and for 1 kilo of beef as much as 7 kilos of feed. Given the enormous markets of 1.33 billion Chinese and 1.16 billion Indians, this created a huge demand. That, in turn, increased the demand for grains by 28% from 2005-06 to 2007-08."
In addition, the demand for biofuels in the USA has skyrocketed and that secures a substantial part of the maize production. "One third of all the maize produced in the US is used for so-called 'corn-based ethanol'. Prices tripled between 2006 and 2008."
Contrary to wheat and maize, soybean production outperformed consumption till 2006. The stocks-to-use ratio's increased. Do to the fact that many US farmers switched to producing maize instead of soybeans, stocks fell back to the level of the year 2000.

Speculators

There was one other factor that unexpectedly influenced the prices of commodities: speculators. Commodity funds in agricultural futures markets have been active for nearly 30 years. The 'traditional funds' provide liquidity by both buying and selling futures and thus facilitating the futures market's longstanding role as a risk-management venue for producers and consumers of agricultural products. Driven by the idea that commodity markets are in the midst of a 'super cycle' – a long term trend that will drive prices higher for years to come – a new type of speculator entered the futures market in early 2005: 'index commodity funds'. They distribute their allocation of dollars across the 25 key commodity futures.
"The booming market became relative attractive compared to the equity and bond markets.



Source: Rabobank based on IMF Data, January 2009

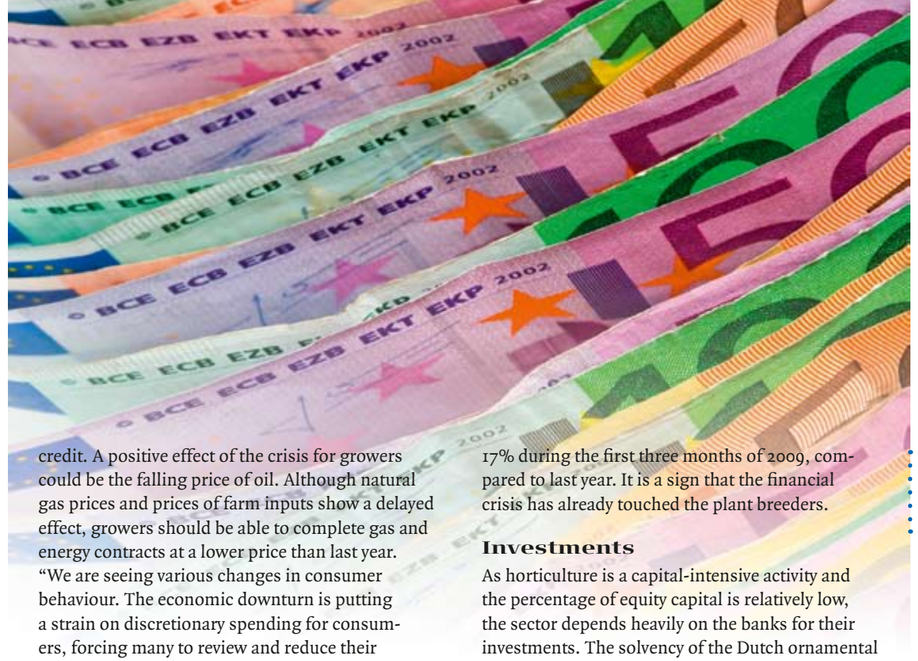
The role of speculators in agricultural commodity markets amplified the upward price trend."
In the meantime, farmers had planned to profit fully from the increased demand. They produced as much wheat and maize as they possibly could. As a consequence, the prices of commodities came down in the first half of 2008. And then the first signs of the financial crisis and consequently the economic slowdown surfaced. In August 2008, Lehman Brothers faced an unprecedented loss due to the continuing subprime mortgage crisis. These mortgages start with low interest rates, but then increase when the houses drop in value. When, at the end of 2007, house prices came down, many of the poorer Americans could no longer meet their payments. "Speculators liquidated their positions at the futures markets, strengthening the downward price trend."

Future

In the near future, 2009-10, farmers will have to cope with the crisis. They face more uncertainty in terms of future crops margins. Furthermore, there is less vendor credit available at farm-input suppliers, which means that farmers, especially in emerging markets, will use less fertilizers and plant protection chemicals. This will further decrease the yields. As a result, grain prices are expected to be volatile in 2009-10. Lower production can result in slightly upward pressure on prices, although this depends on the impact of the demand development resulting from the economic slowdown. The grain markets are fundamentally still tight and, therefore, future production expansion is needed for the longer term. "But in the longer term the situation is not that pessimistic", Dirk Jan Kennes concludes. "The future average price trading range will be below recent levels, but comfortably above the historic average. Until 2015, there is a need for an additional 140 million hectares of agricultural land. If that will not become available, the yield should increase by a staggering 30% to meet additional demand. The latter is more likely for agricultural commodities. All in all, farmers may look forward to better times."

Horticulture

In horticulture, the situation seems far more complex as prices commonly fluctuate quite significantly. Furthermore, the influences of the weather and of the competition on the world market are hard to predict. "For vegetables, the main problem so far is the export from the Euromarket. As the euro has become more expensive, so the export to Russia and the United Kingdom has dropped dramatically", says Cindy van Rijswick, senior food & agribusiness analyst. "Observing trade flows from the Netherlands, we see that especially the export of cut flowers has decreased."
Another huge problem, aside from the changes in the exchange rates, is the availability of export



credit. A positive effect of the crisis for growers could be the falling price of oil. Although natural gas prices and prices of farm inputs show a delayed effect, growers should be able to complete gas and energy contracts at a lower price than last year.
"We are seeing various changes in consumer behaviour. The economic downturn is putting a strain on discretionary spending for consumers, forcing many to review and reduce their choice of restaurant and their retail habits. People tend to dine more at home instead of dining out. However, dependence on fruit and vegetable consumption by the food-service industry is limited, as consumers generally eat more fruit and vegetables at home, than when they eat out."
In retail, consumers are also down-grading. Own-label products and discount value formats seem to gain popularity. "For fruit and vegetable consumption, the effect on volume of all these trends is relatively limited because elasticity of income from fruit and vegetables is relatively low compared to other food sectors, because it is mainly sold under own-label and because it is not very dependent on the food-service industry (like beverage and seafood consumption is, for example). However, we see consumers switching from chilled pre-packed ready-to-cook vegetables to the cheaper tinned or frozen vegetables."
In ornamentals, producers of cut flowers face difficult times, as these are a luxury item where expenditure is closely linked to purchasing power. Within the Euromarket, the effect on garden plants has been negligible so far. "Consumers still want to create a homely atmosphere. And if they have the choice of buying a bunch of flowers that will start to wither after a week and buying a potted plant or a tray of bedding plants, they are likely to choose potted and garden plants." The influence of the expensive euro can also be seen here. The export of, for instance, flower bulbs to the USA has dwindled. Within Europe, not only the export to Russia and the UK has suffered, but also the export to Switzerland, Italy and Poland has shrunk by more than 10%.
The fact that the market for ornamentals is spiralling downwards is further confirmed by the Community Plant Variety Office. According to its President, Bart Kiewiet, the number of applications for plant breeders' rights has dropped by 17% during the first three months of 2009, compared to last year. It is a sign that the financial crisis has already touched the plant breeders.

Investments

As horticulture is a capital-intensive activity and the percentage of equity capital is relatively low, the sector depends heavily on the banks for their investments. The solvency of the Dutch ornamental companies is on average 50%, though some have significantly less. Nearly 20% of the cut flower producers have a solvency lower than 25%. "We have not changed our policy", says Cindy van Rijswick. "So for our clients it has not become more difficult to obtain a loan." However, Rabobank is an exception as it is one of the few banks in the world that still has a triple-A credit rating. Furthermore, as the cooperative has its roots in agriculture, it has a far better understanding of the business and the risks.
"But how much the financial crisis will influence exports of horticultural produce is hard to predict. It is very difficult to determine cause and effect in horticulture. Take for instance the apple and pear exports from the Netherlands. Both are significantly lower than last year. With apples, it has been caused by the increased production elsewhere in Europe. Other countries have sufficient apples of their own and do not need to import. With pears, the reason is the opposite. There are too few pears to export, as Dutch consumers want all that is produced." It just shows how difficult it is to predict what the effect of the financial crisis will be on the horticultural industries.

Halophytes help cope with increasing saline land

Monique Krinkels

Almost all food production is based on the availability of fresh water. And while our planet may look like a water ball from outer space, in reality only a fraction of it is fresh water fit for use. And saline water erodes, destroying fertile agricultural land. In the long run, mankind has two options: either to create agricultural varieties that are salt tolerant or to start eating vegetables that thrive on seawater, the halophytes. The Biosaline Innovation Centre explores both options.

According to the FAO, there are 90 million hectares of land in the world on which nothing will grow due to its salinity. Every year, 2-4 million hectares of land are added to that. These saline regions can be found in North Africa, the Middle East, Pakistan, central China, Uzbekistan and Kazakhstan. In Australia, the USA and the Mediterranean, salt is also becoming a growing problem. Irrigation causes the accumulation of salt in the rooting zone of arable land, as high rates of evaporation and transpiration draw soluble salts from deep layers of the soil. And, of course, climate change will cause sea levels to rise and thus cause seepage of salt water and flooding. At the same time, more agricultural land is needed to feed the growing world population. At the Biosaline Innovation Centre of the VU University in Amsterdam, the Netherlands, researchers are looking for solutions.

Salty potatoes

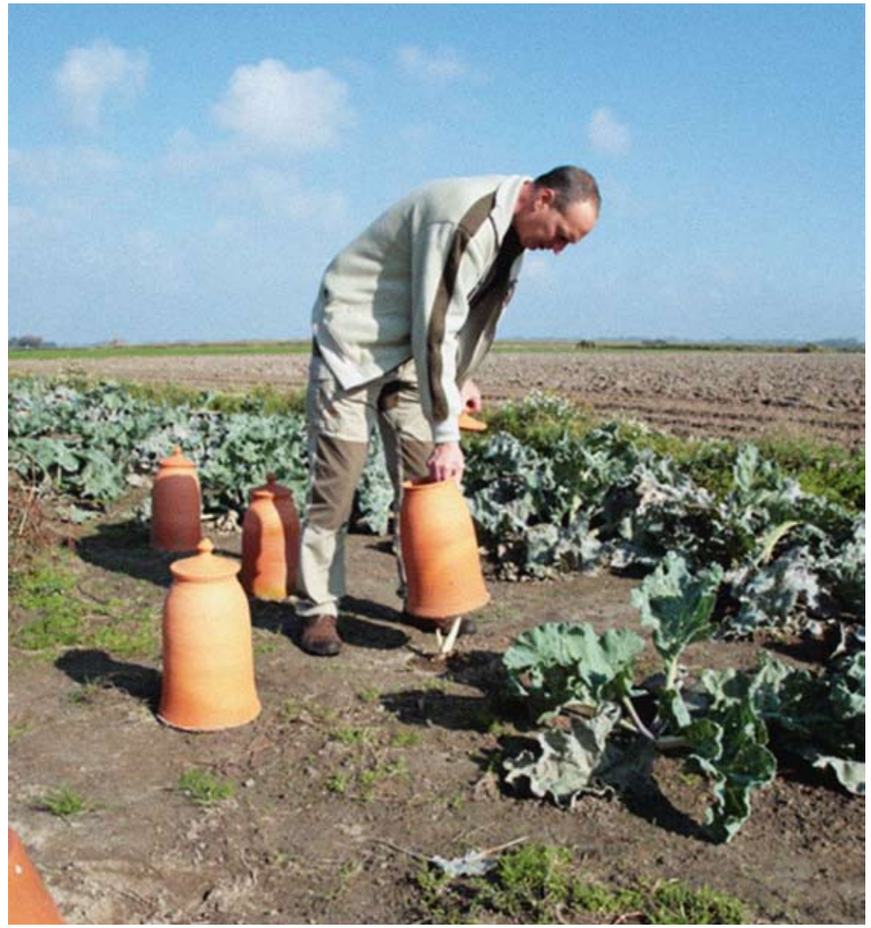
In the centre's laboratory, some potatoes are already showing potential for growth in salty conditions. It has been chosen as a model crop. "We are testing existing varieties for their salt tolerance", says plant physiologist, Dr. Bert de Boer. He started the research almost a year ago. "So far, no one has selected these varieties for this characteristic. The result: there is a clear variation between varieties. Some stop growing sooner than others when the salt concentration of the water is one third of sea water. Currently, we try to understand the mechanisms – differential activity of genes and proteins – behind these different growth responses."

Michel Arends chef at Hotel Brasserie Rebecca combines the blanched stems of seakale not only with fish but also with the lamb fillet for which the island of Texel is famous

"An improved saline tolerance would be important, as the potatoes could be grown on land that is no longer suitable for agricultural purposes. Even the irrigation water may have a higher salt concentration." Besides potatoes, he is also looking for salt tolerant tomato varieties. Humans need 1 gram of salt a day and, according to the health authorities, we should not consume more than 6 grams. Bert de Boer is, however, not afraid that the salt tolerant species could form a health hazard. "It has been shown for example that tomato plants accumulate salt in their leaves but not in the fruits, so it should not influence salt consumption."
Bert de Boer is also investigating whether wild potato and tomato varieties could be used in breeding programmes. He has several species that grow in the Andes under extreme conditions. Salt tolerance in plants is based in part on the same mechanisms as tolerance against drought or cold. "In all these cases, a plant must possess characteristics that help to prevent dehydration. What we want to do is to establish which genes are associated with saline tolerance. These could then be used as markers to accelerate breeding saline tolerant varieties. "We have just started this research programme, which is a joined effort between the Amsterdam group and the group of Professor Richard Visser and Dr. Gerard van der Linden of Wageningen University and Research Centre. In four years' time, we hope to have characterized salt tolerant traits that can be used in breeding. After that, we will advise companies in their own breeding and selection programmes. But it will take at least ten to fifteen years before the first salt tolerant varieties will be marketed."

Alternatives

In the next forty years, the FAO expects that 200 million hectares of agricultural land will be needed in the tropics to feed the growing population. Most of the available land is currently covered with tropical rainforests and regarded as a valuable natural world. Systems ecologist, Professor Jelte Rozema, hopes to find alternatives to spare these forests. "Fifteen percent of the coastal area that has not yet been reclaimed could be used for the production of food and feed. That makes 130 million hectares which could become green oases of marine agriculture. The produce? Halophytes, edible crops that commonly grown near the shores." One of the examples he names is samphire (Salicornia). "It is tasty, has a high oil content, can be grown year round in Mexico and needs only the minerals in seawater. The productivity is higher than that of sunflowers." Sea lavender (Limonium vulgare), garden orache (Atriplex hortensis) and seakale (Crambe maritime) are other crops that could become successful. "Another promising species is fodder beet", believes Jelte Rozema. "These used to be grown in coastal regions and have a high salt tolerance. The tubers can be used as feed, while the leaves can be eaten as a spinach-like vegetable." He has successfully introduced fodder beet in a coastal regions in Pakistan, where the land had become too saline to be suitable for rice production.



From January onwards the plants are covered with pots allowing the young stems to blanch

"To date, these crops have never been domesticated. Selection and breeding should create varieties that have a higher productivity, are more uniform and, thus, fit better in agricultural management systems", says Jelte Rozema. In his laboratory, several experiments are taking place. Researchers are trying to find out what the salt tolerance and vigorousness of the plants are and are analysing the physiology of salt tolerance. Measurements of different parts of the plants show the amount of salts, nutrients, polyphenols, flavonoids and antioxidants. A high content of the latter would stimulate marketing, as the vegetables could then be sold as a health-promoting product.

Long way off

On the island of Texel in the Netherlands, Marc van Rijsselberghe started producing seakale two years ago, much to the delight of the local chefs. Today, the products can be found on the menus of some of the restaurants. The chefs praise the soft kale taste that can be compared to that of green cabbage, but it also has elements such as nut.

Earth

Only 2.5% of all the earth's water is fresh water, and 70% of that is frozen in the icecaps of the polar regions and Greenland. Most of the remainder is not accessible, as it is present as soil moisture or lies deep beneath the surface of the earth in underground aquifers. All in all, less than 0.007% of all water on earth is available for direct human use. This is the water found in lakes, rivers and those underground sources that are shallow enough to be tapped at an affordable cost. Only this amount is regularly renewed by rain and snowfall and is, therefore, available on a sustainable basis.

Salinity

Water salinity is measured in dissolved salts in parts per thousand (ppt). Fresh water contains less than 0.5 ppt; brackish water 0.5-30 ppt; and saline water 30-50 ppt. Water with salt concentrations higher than 50 ppt is called brine.

Variation

The amount of water used per person varies widely. For drinking, cooking, bathing and sanitation a person uses between 27 and 200 litres a day. On average, Europeans use 130 litres per day.

Distribution

Globally, agriculture is responsible for over 80% of the total water used. In Africa, 88% of all freshwater use is for agriculture, 7% for domestic purposes, and 5% for industry. In Asia, 86% is used for agriculture, 6% for domestic use and 8% for industry. In Europe, 33% is used for agriculture, domestic use is 13% and industry uses 54%.

Rice

Rice is one of the crops that need most water. It takes 5,000 litres of water to produce 1 kg of rice. Wheat, for example, needs slightly over half that amount.

The stems can be eaten raw in a salad, stir-fried or blanched, and it is usually served with fish.
"We started the professional production of seakale two years ago", Marc van Rijsselberghe says. It was a slow start, much slower than he anticipated. "I had prepared 1.5 hectares and asked Jelte Rozema to send me the plants. When he explained that I could transport them in my car, I knew something was amiss. Instead of the 22,000 plants I needed, there were only forty available." Jelte Rozema had dug these plants up with his students on the beaches of Normandy. It was one of the first misunderstandings between the scientist and the farmer.
It was purely accidental that he discovered that seakale grew on the pebble beaches of the Afsluitdijk. What he saw, however, was alarming. The plants only grew at one level, two metres above the sea, and could not compete with weeds. Furthermore, there were great differences between the plants. "In France, seakale is considered a delicacy, but it has never been grown professionally", he says. Therefore, there was no information on the optimum growing conditions.
At the university, they had already discovered what the seeds needed to germinate. "The seeds only germinate if they are blown into the sea, washed ashore after two months onto a pebble beach, remain dry for a fortnight and, subsequently, receive a light freshwater shower", mocks Marc van Rijsselberghe. Vigorousness also left a lot to be desired. Of the 15,000 seeds, only 300 plants fully matured.
The plants still need much attention. It took him quite some time to become dexterous in weeding. "We compared the plants with photographs of seakale in order to decide what to pull up and what to leave alone. Only later did I discover that seakale has an aquamarine shine on its leaves which makes it more easily recognizable. In the first year, some of the plants suddenly died, without any reason as far as we could see. However, at the moment, we have 10,000 plants and we are slowly discovering which conditions the plants need to thrive.
It will, however, take a long time before seakale will be fully domesticated. And while the chefs are willing to pay 60 euro for one kilo of seakale, it is not enough to make it commercially viable."

Takii interweaves breeding activities with new acquisitions

Monique Krinkels

In the autumn of 2007, Takii acquired the Dutch ornamental seed company K. Sahin, Zaden B.V. Six months later, the Danish flower seed company Global Flowers was purchased. The integration of these highly specialized seed companies in the Takii organisation is in progress and on target with the projected timeframe. "Takii, Sahin and Global Flowers together can create a synergy that is highly beneficial to our customers and the end-users", says Mr. Denichi Takii, President of Takii & Co., Ltd.

Takii Europe took the lead in the integration of Sahin and Global Flowers in the Takii organisation. In the Netherlands, all office staff of Sahin has moved to the offices of Takii Europe and as of 1st May, all sales of Sahin and Global Flowers will be transacted via the worldwide Takii organisation. The move of the Sahin office staff to the Takii office went smoothly due to the short distance of a mere 25-minute drive between the two offices. This was further helped by the fact that Takii Europe started the expansion of its office facilities in De Kwakel, two months prior to the acquisition of Sahin, so there was ample space to incorporate Sahin office staff with Takii Europe.

New facilities

At the present time, Takii Europe is again expanding its facilities. A new warehouse and new laboratories of in total 2,300 square metres will be constructed in the course of this year. Logistic systems and processes in Europe are being studied and evaluated in order to improve logistic handling and to offer a better service to the customers.
One of the reasons for Takii's decision to expand its ornamental activities in Europe was the desire to breed flower varieties that are adapted to the conditions in north-western Europe. Until then, Takii Europe had mainly screened flower varieties released by Takii's breeding programmes for their suitability under European conditions. "For several species, varieties have to be bred in the climate zone where they are intended to be grown. For instance, Japanese or North American Viola, where Takii already had its breeding stations, grow with less vigour in the main European market countries", says Hendri Veurink, product manager of flowers at Takii Europe. Both Sahin and Global have their own breeding facilities that can be used for that purpose.

Gene bank

With the purchase of Sahin, Takii not only acquired an ornamental seed company but also a large gene bank. How prodigious that collection is, can be perceived on the trial grounds of Sahin in the south-west of the Netherlands. According to Hendri Veurink, it is "one of the most amazing sights you can imagine; hundreds upon hundreds of different sunflowers: multiple and single stems, long and short, large and small flowers, all shades of yellow, dark and light brown centres, you name it." And sunflowers are only one of the many products Sahin has available. How is it possible to integrate such an enormous gene bank into the Takii breeding organization? "Indeed", agrees Hendri Veurink, "the companies seem very different at first sight. If only with regard to sunflowers, Takii has 7 varieties as opposed to 31 that were registered by Sahin. But considering that Takii is supplying only the professional market, where Sahin is supplying both professional and consumer markets, the differences are not so great." Mr. Veurink explains how the breeders have started to make an inventory of all the characteristics of all the breeding material available. Also, the collection was split up into a professional and a consumer assortment. Now it is up to the breeders to use the available material to develop new lines. It is a big challenge, but Takii feels confident that the results will be worthwhile.

New assortment

With Sahin, Takii also acquired products which were completely new to their own assortment. Veurink mentions, as an example, one of the Sahin specialties, their extensive Tagetes collection. Among them is a remarkable one, the Tagetes patula (French marigold) 'Ground Control'. It is used as a biological control of the nematode Pratylenchus pentrans. In tests, it has proven to reduce the number of nematodes to almost zero. With the acquisition of Global Flowers, Takii obtained a valuable addition to its own portfolio. "Takii has its own Lisianthus varieties, but Gerbera, Primula and Begonia will be new in our catalogue", according to Veurink.
Integrating companies, each with a different culture, different products, different systems, is a process that takes some time. But Takii is positive that all changes are for the better and that the three companies together will prove to be stronger and even more successful in the future.

Top left: Gerbera jam Royal Watermelon F1

Top right Delphinium elatum Aurora Mix F1

Bottom left: Helianthus annuus Magic Roundabout F1

Bottom right: Primula acaulis Mega Bicolour Mix F1

Takii & Co., Ltd.

Takii is one of the world's leading seed companies. Founded in 1835, Takii will celebrate its 175th anniversary in 2010. Takii has established a worldwide network with Japanese fundamentality for breeding, production, marketing and sales of a wide assortment of flower- and vegetable varieties that are adapted to actual market demands. The head office is located in Kyoto, Japan.

Takii Europe BV

In 1990, Takii established Takii Europe in the Netherlands. At first, Takii Europe was meant to be the distribution centre for Europe. At the facilities in De Kwakel, they also started breeding activities in various vegetable crops. Additional breeding activities, as well as seed production, are taken care of by Takii France.

K. Sahin, Zaden BV

Sahin was established in 1982 by Kees and Elisabeth Sahin. The company has a huge gene bank and receives international recognition in the flower seed trade as a supplier of novelties, many of them award winners. They sell their varieties to the professional and the consumer market worldwide. The company is located in De Kwakel, the Netherlands.

Global Flowers A/S

Global Flowers was established in 1996. The company specializes in high-quality flower varieties of pot plants, bedding plants and cut flowers for the professional market. Their main products are Begonia semp., Gerbera, Lisianthus and Primula. Global Flowers exports flower seed to countries worldwide. The company is located in Odense, Denmark.

Trained eyes discern miniscule differences

Monique Krinkels

With thousands upon thousands of varieties on the market, the chance that a new addition is hardly distinguishable seems more than likely. After all, how many red colours could possibly exist in tomatoes or roses? "Enough", reassures Kees van Ettekoven, manager of Varieties & Trials at Naktuinbouw, the Netherlands. "Of the 2,000 candidate varieties we receive each year, less than 2 percent is insufficiently distinct. This stream is not likely to come to a standstill."

According to Kees van Ettekoven the growth in numbers of new varieties will not cease in the foreseeable future. As manager of Varieties & Trials, he is responsible for the tests on propagated vegetable, agricultural and ornamental plants for Distinctness, Uniformity and Stability (DUS). The aim is either registration of a new variety, application for plant breeder's rights, or both. Naktuinbouw is the only organisation in the Netherlands that is authorised to execute these tests for the authorities of the national Board for Plant Varieties and the Community Plant Variety Office (CPVO). Together with Kees Grashoff and Raoul Haegens who are responsible for respectively ornamentals and vegetables, he explains his confidence in the breeders to keep coming up with new varieties.

Formidably sensitive

The number of registered varieties is enormous. The EU-list contains, for instance, more than 2,000 lettuce varieties and 3,000 varieties of tomatoes. In the ornamentals, Hemerocallis, or daylily, is the absolute leader with over 70,000 varieties. "But the human eye is able to discern 400,000 to 1,000,000 colours", states Raoul Haegens. It needs some training, but experienced variety inspectors can do that. Untrained, the ability to distinguish colours depends on the environment people live in. For instance, Americans are better in the purple and pinkish colours, while people living in wooded areas see more greens. And colour is only one of the characteristics. The same eyes are, for instance, able to discern a length difference of only a millimetre."

Article 7 of the 1991 UPOV Convention

'The variety shall be deemed to be distinct if it is clearly distinguishable from any other variety whose existence is a matter of common knowledge at the time of the filing of the application'

The fundamental definition of UPOV of what distinctness is, remains rather open. Finding out whether a variety is 'new' by merely seeing whether it is 'clearly distinguishable' would not be very practical. Therefore, UPOV developed 'test guidelines' with morphological characteristics. In CPVO, following UPOV, the EU member countries have agreed on a fixed, obligatory set of morphological characteristics that the inspectors have to check. "In lettuce we look for about forty identifying characteristics, in courgette 90, in rucola 15 and in Cymbidium 100", according to Kees Grasshoff. There are three types of characteristics: qualitative, quantitative and pseudo-qualitative. Qualitative characteristics (either/or characteristics) give clear undisputed minimum distances. The quantitative characteristics are the most sensitive to growing conditions and observation techniques. Therefore, example varieties (standards) must be incorporated in the examination. The pseudo-qualitative characteristics are for instance colour tones and shapes. "DNA tests are not used to establish distinctness. The problem is that a large part of the plant genome consists of DNA with no or unknown effects on the morphology, the so-called junk DNA. Lily has probably the largest genome in the living world, with 106 billion base pairs. No less than 90 percent of this genome seems to have any effect on the morphological appearance of the plant at all. On the other hand, a similar DNA band pattern in tulips may belong to two clearly different varieties, for example, because of a point mutation that changes the colour. So to establish distinctness, DNA does not yet help us at all in this particular discipline", explains Kees van Ettekoven. "The other way around is, however, very effective. If a breeder believes someone illegally propagates his variety, a DNA test can either confirm or negate that fact to a great degree of certainty.

New facilities

In the new greenhouse of the Naktuinbouw, the first plants are already displayed. Rows of tiny vegetables fill one of the compartments, while in another several hundred new Phalaenopsis applications are ready to be tested. "Our new facilities are especially designed for DUS-testing. Every plant will grow up in exactly the same conditions, to avoid any difference being observed that is not inherited, but created by growing conditions." Around the corner, a fully equipped photo studio is available. All vegetables and ornamentals are photographed. The photographs are stored in the photo database of Naktuinbouw. Discussions have started to make most ornamental pictures available to the general public, together with a short description to be published on the website of Plantscope. In a special observation room, the plants are

Test your eyes

Phalaenopsis

Even three white Phalaenopsis flowers can be sufficiently distinct to be recognised as separate varieties and the same goes for butterhead lettuce and lollo rosso. It needs however the eyes of an expert to notice all of the differences.

How many differences do you observe between the varieties underneath? (for the solution see page 42)

Butterhead lettuce

Lollo rosso

In the new greenhouse, all plants grow in exactly the same conditions to avoid distinctness caused by light, temperature or moisture differences.

Minimum Distances

described. “The window faces north, to ensure direct sunlight does not influence the objectivity of colour measurements.” Back in the greenhouse, he shows the candidate Phalaenopsis varieties. “The DUS-test of these plants only takes one year”, explains Kees Grashoff. “Establishing distinctness and uniformity are the main objectives. As the breeder sends the plants to us at a very early stage, he cannot select on appearance beforehand. If all plants are uniform, we assume that stability is proven also.”
To establish whether a Phalaenopsis is distinguishable, the plant is compared to similar varieties in the reference collection. Grashoff shows a white candidate variety and a plant from the reference collection. At first sight they might have been clones, but he points out several differences a layperson would easily overlook. Two other plants have clearly distinguishable characteristics. “But these have to do with the age of the plant. The overall look of the plant changes when ageing and the roots will develop to an adult root system.
This side by side comparison is the preferred way of testing vegetables, but in ornamentals it does not always work. “If possible we do it, but the problem with the living reference collection and non-living reference collection in our photo database is that it is always limited. Take this Phalaenopsis”, he points out, “in order to compare living plants, we should ask colleagues from, for instance, Korea to send us their varieties. That would be impractical and increases the examination fee for applicants. So, as an ultimate check, we have so-called ‘walking reference collections’. External experts, often breeders themselves, who have a thorough knowledge of a certain species visit the test and give their advice whether the candidate should be compared side by side with another comparison variety in a second year of examination.”

Me-too

Van Ettekoven believes that the discussion around the me-too varieties and essentially derived varieties is heading the wrong way. “A variety is either distinct or it is not, it is that simple”, he says. “If its distinctness is based on a few prominent characteristics, it might be an EDV but at the moment there is insufficient case law to clearly foresee if a distinct variety is also an EDV. If that causes a problem, maybe the rules for DUS-testing should be discussed to add to the number of identifying marks. As it stands now, these are our guidelines.”
But he believes it is true that nowadays the term distinctness is subject to devaluation, as the resemblance between new varieties increases. “But creating morphological diversity is only a breeding goal in ornamentals. Vegetables should look and taste more or less the same, as they should come up to the expectations of retailers and consumers.” For instance, a cucumber should measure exactly 30 centimetres, not 29 nor 31, to fit snugly in the box. The colour should be dark green as consumers associate that with the fresh taste.
“In vegetables we have to look for other characteristics, such as productivity and resistances. But it is increasingly difficult to establish distinctness due to decreasing minimum distances. The notion of ‘borderline distinctness’ has become prevalent, not only in cucumber, but also in lettuce, tomato, cauliflower and French beans.”

New molecular techniques enable ‘GreenGene’ revolution

Annet Lamers

Biotechnology has advanced enormously as a result of new technologies. The research company KeyGene, based in Wageningen, the Netherlands, is playing a key role in these developments. Its speciality lies in Accelerated Molecular Breeding, mainly through high-end DNA fingerprinting. Molecular Mutagenesis is one of their newly developed techniques which improves and accelerates breeding.

“The world population is growing rapidly and will continue to do so until 2025, from 6 billion to 9 billion people. Apart from the 800 million wealthy people already living in western countries, a further 800 million rich consumers will be in existence by 2010–2015, mainly in the BRIC countries (Brazil, Russia, India and China). More and more people will be eating meat, which will put extra pressure on the agricultural industry”, predicts Arjen van Tunen, CEO of KeyGene. “The BRIC countries will be the new agricultural super powers, apart from the USA and EU, which will have to provide the extra production that will be required.”
The demand for the so-called six ‘F’ crops: Food, Feed, Fuel, Fibres, Flowers, but also Fun crops, such as trees, grass for lawns and coffee, tea and cocoa, will escalate quickly, according to Arjen van Tunen. “It is a realistic scenario, judging by all the new developments that are taking place. The advancement of propagation material is faster than ever, but with lower costs.”

Breeding by design

KeyGene is well-known because of its molecular breeding, mainly AFLP genetic fingerprinting. The AFLP technology was developed in the early nineties by KeyGene, and is a very popular and powerful DNA fingerprinting technology, used all over the world. With recently developed new DNA sequencing equipment, it is now possible to determine large amounts of DNA sequences very rapidly, and it is becoming much more feasible to link traits directly to differences in the DNA. We classify this as ‘Advanced Molecular Breeding’.
“We have made significant progress in this field”, says Van Tunen. “Due to Advanced Molecular Breeding, cross-breeding can be accelerated considerably. The difference from traditional crossing is that one looks at the differences in the genome, and not exclusively at the phenotype. In our genotypic crossing strategies, we do not have to put aside plants that are phenotypically unfavourable, but we will use them if their genome is optimal for crossing. We have labelled that concept ‘Breeding By Design’.”
The results of this type of cross breeding are, for instance, Nasanovia-resistant iceberg lettuce, virus-resistant cucumber, long-term storable cucumber and hybrid rye. The hybrid rye was developed by KeyGene together with the German company, KWS. “It is also possible to stack resistances. This was used to develop a virus-resistant pepper with Enza Seeds.”
Genetic modification is currently not used by KeyGene. “We only conduct limited research with GMO’s, but there is no product development”, says director Van Tunen. “At this time, GMO is economically unfeasible for smaller crops due to the high deregulation costs. Besides, there are uncertainties in the European and Japanese legislation and GMO is technically not very flexible. We tend to see more interest in Accelerated Molecular Breeding and the new Molecular Mutagenesis.

Molecular Mutagenesis

Mutations, whether natural or induced, can also accelerate classical breeding. KeyGene uses two molecular techniques to screen or induce mutations directly at DNA level: KeyPoint and KeyBase. With the KeyPoint technology, mutations can be selected by means of sequencing. They can be found in EMS-populations where point mutations have been initiated or selected from the existing genetic diversity within the crop. KeyPoint identifies the favourable alleles and makes them available for further breeding. The KeyBase technology is aimed at introducing a mutation in the plant’s genes at predetermined, specific points in the genome. This is done through the introduction of a point mutation in one of the genes, using a surgical method. Then, this cell is propagated and multiplied. This recently developed technology has already been successful in four crops. Van Tunen does not want to elaborate on it. He only says that the company is aiming for resistances and quality genes and that the breakthroughs are very promising.

Bio-informatics

Biotechnology can no longer do without high quality databanks and informatics expertise in analysis and interpretation. There is so much information available from the genomes of the various crops that more and more computer power is needed to keep a grip. Finding new opportunities in identifying favourable alleles or combinations thereof, the so-called lead discovery, is the main objective. KeyGene is using a very large, extra-secure server room, filled with an enormous number of computers for this purpose. Via glass-fibre cables, they are connected to SARA, the scientific Amsterdam supercomputer. This just seems to prove the gigantic flow of date involved.
“Bio-informatics has taken an enormous leap forward”, indicates Van Tunen. “A quarter of our researchers are working solely with the computer. It has now become a necessity. We also have an increasing demand for phenotypical marking possibilities. So much is possible with DNA, that in order to keep up to speed with the phenotypical side, the need for robotisation and automation is increasing.”
Arjen van Tunen shows us a greenhouse, where tomato plants are randomly put on a conveyor belt in order to avoid surrounding influences. Once a day, all the plants are photographed three-dimensionally, enabling digital registration of certain quantitative properties. Together with Advanced Molecular Breeding techniques, molecular technology, and mutation technology, KeyGene is transforming plant breeding into a true GreenGene Revolution.

‘The improvement of the propagation material is going faster than ever against lower costs’, according to Arjen van Tunen

Break-through in whole genome sequencing and assembling

Annet Lamers

Plantbreeding will change dramatically in the next five to ten years, predicts Arjen van Tunen, CEO of biotech company KeyGene. "Selection using markers will be replaced by selection using CEO sequences. Thanks to the Whole Genome Profiling technique, sequencing and, thus, also genome assembly, is becoming much more cost effective."

Together with their American partner Amplicon Express, KeyGene has developed a new method of mapping plant and animal genomes which is much faster and much more accurate. This method, called Whole Genome Profiling (WGP), uses Bacterial Artificial Chromosomes, so-called BAC's, in a very ingenious way. BAC's are cloned DNA parts, the size of approximately 120,000 base pairs (bp). Amplicon Express provides expertise in the field of isolating DNA from plants, cloning of large DNA fragments in BAC libraries and arraying these BACs. KeyGene's input consists of their high throughput sequencing expertise and facilities (such as the modern Roche 454 Titanium Genome Sequencers and Illumina Genome Analyzers II) and bio-informatics expertise. As a result of this co-operation, the sequencing and assembling of complete genomes has taken a giant leap forward. Arjen van Tunen explains that the traditional, so-called Whole Genome Shotgun sequencing method using ABI sequencers provides a medium throughput of DNA fragments of approximately 800 bp. "The 454 technique of Roche produces a high amount of DNA fragments approximately half that size. The challenge is to put those tiny pieces, illustrated as chocolate vermicelli, together in the correct order. Our new WGP technique generates a kind of DNA frame along which these fragments can be aligned. To generate the frame, we use much larger fragments of 120,000 bp. Compared to the vermicelli, these are chocolate bars."
"In the large 120 kBase DNA-strings, we sequence small tags of 35 bp, on each 2,000 base pairs. By comparing the similarity of tags in different DNA strings, we are able to assemble large pieces together. On that construction, we then fit the short (450 bp) DNA sequences which we have determined using the 454 Titanium Sequencer. Consequently, the quality of genome assembly increases, whilst the costs are considerably less. When we have generated this type of superior genome assembly, we can subsequently translate potential gene sequences into commercial traits in close co-operation with our partners in the breeding industry."

Assembling small DNA fragments into contiguous genome stretches (illustrated here as chocolate vermicelli) is a giant task in Whole Genome Sequencing. The whole genome profiling technique makes this much easier. This technique provides a frame along which DNA fragments can be aligned.

Applications

As a proof of principle, KeyGene and Amplicon first constructed the well-known Arabidopsis genome (sized approximately 130 million bp) all over again. Melon (450 million bp) was the first commercial order. "The sequencing alone was ready within a week. With the help of bio-informatics, we needed only a few months to get a good idea of the whole genome. The tomato (950 million bp) is one of our next commercial projects", explains Van Tunen. KeyGene is working on that in close cooperation with the Centre for BioSystems Genomics, CBSG, a consortium of major Dutch and international companies and top plant scientists working on potato, tomato, Arabidopsis and Brassica, and based in Wageningen, the Netherlands. The whole genome profiling method is also suitable for animal- and human genomes. "We are able to screen very effectively considerable numbers of total genomes for deletions, insertions, inversions and other genome changes. This is, for instance, important in characterising some tumours.

New programme safeguards vegetable plant health

Jaap den Dekker and John van Ruiten

French and Dutch organisations of seed producers and plant producers (FNPSP, SF3P and Plantum) have been working together over the last two years to develop a system which will provide better guarantees that infectious diseases will not spread within production systems. In cooperation with SOC (Service officiel de Contrôle, France) and Naktuinbouw (Inspection Service for Horticulture, the Netherlands) an accreditation system is modelled.

Jaap den Dekker is assistant managing director of Plantum NL. John van Ruiten is director of Naktuinbouw.

Initially, the primary focus of the system will be to prevent problems with Clavibacter in seed and plant production of tomatoes. It is foreseen that more crops and pathogen prevention programmes will follow in the coming years. This year will be used to finalise the set of requirements for the system, to set up the organisation structure, to develop an accreditation scheme and formulate requirements, to carry out so-called pre-audits and to arrange all practical and financial matters. A trademark is expected to be formally launched by the foundation by the end of this year. As soon as the definitive name is available, it will be introduced by the foundation.

Background

During the past three years, Clavibacter has severely infected several tomato crops from time to time throughout the world. The cause of the problem has not yet been identified in each case. A link between seed, plants, fruits, people, water or other vectors has been established in only a few of the many cases. New plant propagation techniques, like grafting, create particularly favourable conditions for bacterial diseases like Clavibacter to spread rapidly and increase further infection risks. Other inoculum sources, such as other hosts (weeds/ornamentals) or contaminated equipment, are important as well. The organism Clavibacter can survive in soil, greenhouse structures, equipment and for longer periods in plant debris. Early recognition of the disease, especially in greenhouse crops, is essential if the disease is to be contained. Bacterial cancer is one of the most important diseases to control. First, there is the problem of detecting infected plants and seeds. Second, the highly infectious nature of the disease, the number of potential sources of inoculum and the absence of effective chemicals for treatment mean that sanitation and preventative measures must be enforced.

Reliable tests

An important consideration is the development of better and more reliable test techniques, both for seeds and for plants. Lower detection levels and more specific identification are necessary. Several initiatives are running around the globe aimed at improving testing for Clavibacter. Already, a number of adjustments in protocols have been implemented. One important development is that the chance of overgrowth of Clavibacter by antagonistic bacteria is distinctly reduced through spiking of samples with Clavibacter. Also, new improved semi-selective media and a more specific PCR have been developed recently in the Netherlands and will be implemented shortly after the appropriate validation. Within international organisations (for instance, within ISHI and EPPO), further cooperation will surely lead to much better test protocols. An important move is also to validate the new protocols and to promote that one new protocol will be used widely, and that it might lead to an internationally accepted method of detection and identification of Clavibacter (by both Inspection authorities and the seed industry).

Preventative measures

But even more important than testing is the prevention of infections in seed production facilities and in the facilities of plant producers. A detailed set of preventative hygiene measures has been developed, together with a practical checklist for implementing them in companies. The measures focus on the four most important threats of introduction of pathogens, such as Clavibacter: people and their clothes, propagating material, other materials and water supply. A quality management system and manual must document the activities carried out by a company to actively control these risk categories. An essential element in the Clean Seed, Clean Plant programme is to define various segregated zones of 'cleanness' at locations: green zone ('fully controlled'), yellow zone ('intermediate/entrance') and red zone ('not controlled'). The purpose of these zones is to effectively lock the controlled green areas with a package of clear and demonstrable measures to prevent or minimize the possibility of introducing contamination. Each company/location has to carry out a risk analysis to determine specific elements of risk for their site. The separation between the zones depends on the actions taken after risk assessment. Although parties involved are convinced that the existing hygiene measures in all areas of seed production and plant cultivation are strict and severe, the systematic implementation of a quality system

Strict hygiene protocols will help prevent spreading diseases

throughout the whole supply chain will lead to further improvement. Moreover, the final result – an accredited system for preventing Clavibacter- will make communication to the growers more transparent, will form a solid basis to demonstrate the quality measures in place and will lead to a clear-cut distinction between professional plant nurseries and seed companies, compared to other players in the market.

Organisation structure

The seed and young plant industry will set up a Foundation to manage the Clean Seed, Clean Plant programme. The Foundation, with a Board made up of nominated representatives of amongst others FNPSP, SF3P and Plantum, will own the documents with descriptive protocols, company checklists, and the logo/brand (registered quality mark) which will be introduced as soon as it is registered. The logo/brand can be used by accredited companies. The Foundation will have a technical Working Group that will be responsible for:

- defining and maintaining Clean Seed, Clean Plant protocols and company checklists;
- developing additional Clean Seed, Clean Plant protocols and checklists for other pathogens and species;
- supporting the Clean Seed, Clean Plant Board.

The Foundation is preparing a contract with SOC/ Naktuinbouw to be responsible for the coordination of the audits that will be carried out at locations applying for Clean Seed, Clean Plant accreditation. The contracted organisations, SOC and Naktuinbouw will set up a joint structure which will be able to:

- work with an accreditation scheme with clear controllable requirements (based on Clean Seed, Clean Plant documents/protocols);
- carry out auditing in all countries where seed and plant production locations exist. If necessary, sub-contracting will be done to local competent organizations and auditors;
- have a reasonable number of qualified trained auditors with (practical) knowledge of crops/pathogens available;
- organize the audits (initial and maintenance)
- propose changes/improvements to Clean Seed, Clean Plant protocols
- report to both the companies (audit reports) and to the Clean Seed, Clean Plant Foundation (main observations and result of audits).

After an audit has been carried out, the international audit coordinator will formulate the result and present it to the Foundation. The Board of Clean Seed, Clean Plant Foundation has the responsibility to make the final decision about the accreditation of the company and the use of the Clean Seed, Clean Plant logo/brand by that company.

Work to be done

Various organizational aspects elements (including setting up of the Foudation, financial points, contracts and regulations) are going to be finalized by the end of 2009. During 2009, so-called pre-auditing will be possible for companies/locations, both to further adjust their internal hygiene system and to further optimize the proposals for the regulations and control procedures in the accreditation scheme. When the various elements are finalized, it will be possible for all companies involved in the production of tomato seed or young tomato plants to apply for the accreditation. When the first companies are accredited by the end of 2009 or early 2010, it will probably take another six to twelve months before seeds and young plants with the quality mark will become available.

International regime on access and benefit-sharing still an uphill battle

Anke van den Hurk

The practical interpretation of the 3rd objective of the Convention on Biological Diversity (CBD) remains a hot potato. After a week of discussions during the 7th meeting of the Ad Hoc Open-ended Working Group on Access and Benefit-Sharing (ABS), the results are disappointing. Virtually none of the most controversial issues have been addressed, and a number of new ones have been added.

Around 400 people, of whom three were representing the broad seed industry, were present in Paris, France. From 2 to 8 April, they negotiated about the text that was developed during the 6th meeting in Geneva, Switzerland, last year. The meeting was focused on the objective of the international regime, its scope, compliance, fair and equitable benefit-sharing, and access. The five resulting documents remain full of square brackets, nearly 3,000. All text between the square brackets is text upon which no agreement was reached. This text needs to be negotiated further in the coming two working group meetings later this year in Montreal, Canada, and early next year in Colombia.

Objective and scope

One of the topics that were discussed was the objectives of the convention. The majority of developed countries preferred to focus on access and benefit-sharing and the use of genetic resources. In contrast, the developing countries wished to have a broader objective. They wanted the objective not to be focused on genetic resources alone, but also on biological resources (Africa), derivatives, and products. Also with regard to scope, not much agreement was reached. Especially, the discussion on inclusion or exclusion of pathogens caused a fierce debate. Developed countries are of the opinion that the international regime should not apply to genetic resources acquired before the international regime came into force; genetic resources that a party decides to offer without access requirements or benefit-sharing; species/crops listed in Annex I of the ITPGR; genetic resources in areas beyond national jurisdiction; specific uses of pathogens. Developing countries see this issue differently. They are of the opinion that all biological and genetic resources, their derivatives and products, also those acquired before the entry into force of the CBD, should be included. Furthermore, they strongly advocate the inclusion of all pathogens in the regime. With regard to the Annex I of the ITPGR, they agree that this should be excluded. When regulations on access and benefit-sharing are adopted, there will be a need to encourage, monitor and enforce compliance. The developed countries would like to have a system to monitor compliance that is feasible. Developing countries, on the other hand, would like to have strong measures to control compliance. They proposed tools such as a strict certificate of compliance, tracking and reporting systems, disclosure requirements in IP applications, and a system of checkpoints. The participants also could not agree on the way compliance should be enforced. Most developed countries would like to see that ABS agreements are organized through contracts and follow daily business practices. Developing countries, on the other hand, would like the user countries to be responsible for checking if users have fulfilled all the rules and regulations. In case this is not done, sanctions and remedies should be taken. Representatives of the seed industry warned the assembly that an obligatory certificate of compliance could provide a false sense of security. Furthermore, the disclosure of origin is not always possible, as the country of origin of plant varieties may not be known.

Access and benefit-sharing

As expected, the developing countries would like to expand benefit sharing as much as possible, while the developed countries would like to limit this as far as possible and leave it up to the parties that exchange the material. Both monetary and non-monetary benefits could be shared. There is still a lot of discussion about whether technology transfer, exchange of data, etc. should be obligatory or not, or mutually negotiated. The seed industry prefers to work with model clauses, preferably the Standard Material Transfer Agreement, smta. Major issues in the discussions on access included linking access to fair and equitable sharing of benefits; international access standards and simplified access rules for non-commercial research. Developed countries advocate clear national legislation that provides legal certainty, clarity and transparency to both provider and user. Developing countries are of the opinion that benefit sharing should get priority in the regime and should not necessarily be linked directly to access. Plant breeders are concerned that it might become difficult and complex to obtain Prior Informed Consent (PIC). Also, the duration of the application process for access is still a source of concern.

Newly discovered hormone inhibits branching

Geert-Jan de Klerk and Paweena Pumisutapon

In many crops, micropropagation is based on forced outgrowth of axillary buds brought about by addition of cytokinin. In intact plants, axillary buds are blocked by auxin and released by cytokinin. Recent studies on branching mutants in Arabidopsis, petunia, pea and rice report a new branching inhibitor, a carotenoid-derived hormone. This paper discusses present knowledge about the regulation of outgrowth of axillary buds and its significance for micropropagation.

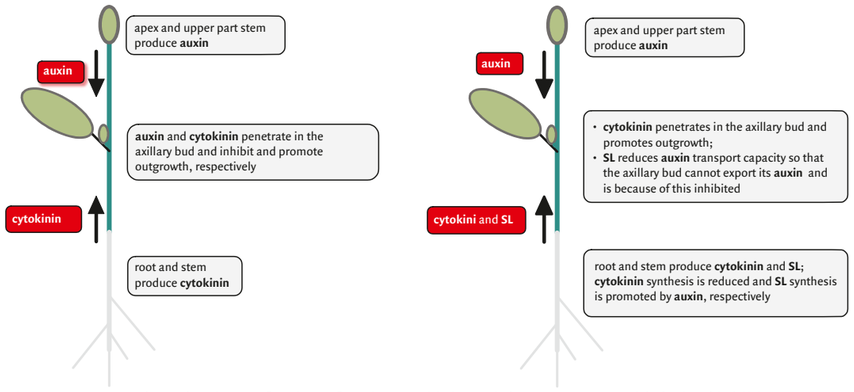


Figure 1. Proposed mechanisms of action of auxin, cytokinin and the new carotenoid-derived inhibitor strigolactone (SL). The long-distance signals are in the red boxes. The indicated mechanisms are provisional and not yet fully corroborated with experiments. Left the initial mechanism proposed briefly after the discovery of the roles of cytokinin and auxin. Right the recently proposed mechanism.

In animal physiology, hormones denote substances that are synthesized in low amounts in one part of an organism and transported to target tissues at distant locations, where they exert an effect. In plants, similar chemical messengers have been found. A classical example occurs in germinating barley seeds: gibberellin synthesized and released by the embryo diffuses to the aleurone layer where it induces synthesis and secretion of hydrolytic enzymes. These enzymes degrade macromolecular reserves into small fragments that are used by the embryo for initial growth.
In contrast with animal hormones, the synthesis of plant hormones is mostly not localized in a specific tissue, but occurs in many different tissues. Furthermore, plant hormones often act at the site of synthesis. Another property of plant hormones is their lack of specificity: each influences a wide range of processes. Auxin, for example, has been found to influence cell elongation, cell division, induction of primary vascular tissue, adventitious root formation, callus formation, senescence, fruit growth, outgrowth of axillary buds and sex expression. Auxin was discovered in the 1920s. Four other hormones - cytokinin, gibberellin, ethylene and abscisic acid - were discovered during the following 40 years. This group of five hormones is referred to as the 'classical hormones'. After that several compounds with hormone-like characteristics have been discovered, such as brassinosteroids, peptides, etc. Auxin, cytokinin and gibberellin are actually families of compounds: in plants various structurally related chemicals occur that all have auxin, cytokinin or gibberellin activity.

Axillary buds

The outgrowth of axillary buds is controlled by the apex: the axillary bud resumes growth when the apex is excised. The underlying mechanism, inhibition by auxin synthesized by the apex and transported downwards in the stem, was discovered a few years after the discovery of auxin. This was shown simply by replacing the excised apex by lanoline paste with auxin. When cytokinins had been discovered, it was examined soon whether they had an effect on outgrowth of axillary buds. This was indeed demonstrated. As roots and apex are the main site of cytokinin and auxin synthesis respectively, an attractive scheme could be made in which outgrowth of an axillary bud is under the control of apex and roots (Fig. 1, left).

Wageningen Tissue Culture Center, Wageningen University and Research Center

Figure 4. Bushy zantedeschia. This epigenetic variation is related to the tissue culture conditions. After tissue culture during which apical dominance is broken each subculture cycle by addition of cytokinin, apical dominance is not restored after transfer to soil. There are no changes in cytokinin levels. Possibly, the off-type plants are protractedly disturbed with respect to the carotenoid-type inhibitor.

There were, however, various problems with this model. It was in particular not clear how auxin acts. Initially it was believed that auxin migrates into the axillary bud and acts there as an inhibitor. This mechanism did not survive critical testing. Experiments with radioactive auxin showed that auxin does not move into the axillary bud. So the mechanism of action of auxin remained a mystery. One possible mechanism would be via a second messenger. Cytokinin is a possible candidate. Indeed it has been shown that auxin negatively interferes with cytokinin, in particular auxin reduces cytokinin synthesis.
An other possibility is that polarity established by polar auxin transport, is somehow inhibitory. Correspondingly, it was shown that auxin transport in the main stem reduces auxin transport out of the axillary bud. This phenomenon has been termed 'auxin-transport-autoinhibition' or ATA. The underlying mechanism is however unknown. Active transport of IAA out of the axillary bud is believed to be required for axillary bud growth (Fig. 2).

Mutants

Understanding of plant developmental processes has benefited much from research on mutants. Branching mutants in which apical dominance is reduced, have been studied in pea, rice, petunia and Arabidopsis. In the case of Arabidopsis, extensive experimenting has been carried out in which mutant scions were grafted on wildtype roots and vice versa. The outcome was among others that many branching mutants (in Arabidopsis MAX1, MAX3 AND MAX4; MAX = more axillary meristem) lack enzymes in the carotenoid biosynthetic pathway. This demonstrates that a carotenoid-derived compound synthesized in the roots inhibits branching. The grafting experiments indicated that the synthesis of this new hormone-like compound is localized in the roots and that it travels upwards into the shoot. In pea and rice, this compound has been recently identified as strigolactone. This compound has more effects. Plant roots excrete strigolactone to attract mycorrhiza. Excreted strigolactone also stimulates germination of parasitic plants such as Striga and Orobanche.
The mode of action of the carotenoid-derived hormone is still unclear. It has been conjectured, partly on base of PIN1-presence, that the carotenoid-derived hormone downregulates PIN1. PIN1 is an auxin efflux carrier and a driving force in polar auxin transport. Because the carotenoid-derived

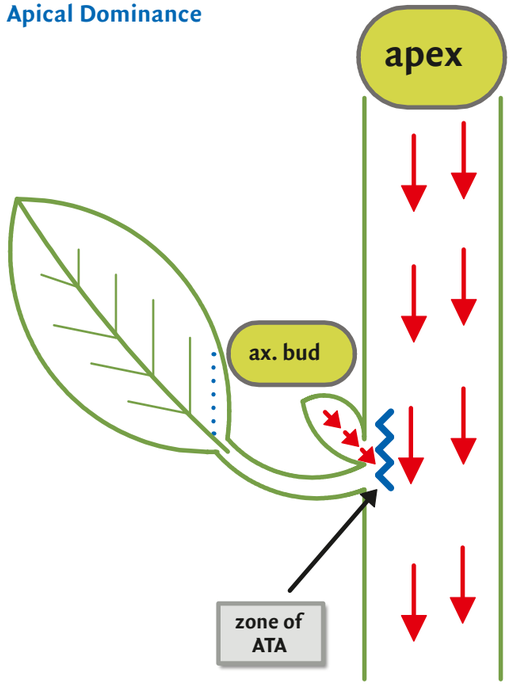


Figure 2. Proposed mechanism of action of auxin transport on outgrowth of axillary buds. Auxin is actively transported from the apex downwards in the stem (red arrows). Because of the phenomenon 'auxin-transport-autoinhibition' (ATA) active auxin transport out of the axillary buds (small red arrows) is inhibited and as a consequence the axillary bud is inhibited.

hormone is reduced in the MAX-mutant, PIN1 is abundant, leading to enhanced auxin transport. It has been conjectured that in mutants auxin is more easily released from the axillary bud into the main stem and that this enables outgrowth of the axillary bud. The polar auxin transport system has only a low capacity in the nonmutated wildtype plant. Therefore, auxin cannot be released from the axillary bud so that this bud remains blocked. This mechanism explains the reversion of the effect of MAX-mutations by auxin transport inhibitors (TIBA or NPA). In wildtype plants these inhibitors usually promote outgrowth of the axillary bud. At the same time, the 'old' regulatory mechanism

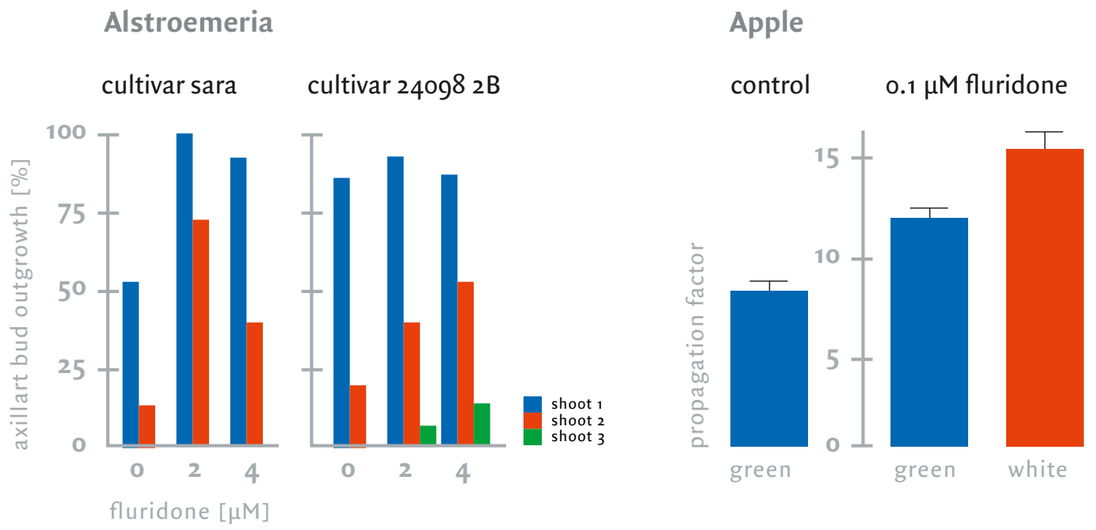


Figure 3. Effect of addition of the carotenoid-synthesis inhibitor fluridone on outgrowth of axillary buds in alstroemeria and apple. In apple, a distinction was made between green and white shoots. Whiteness is a marker for penetration of fluridone because fluridone inhibits carotenoid synthesis. The apple data are redrawn from G. de Klerk, Acta Bot Neerl. 42: 443-451.

also holds and may be based on inhibition of cytokinin synthesis by auxin (Fig. 1, right).

Alstroemeria

We have initiated a research project on apical dominance in alstroemeria. From the practical point of view, elucidation of the mechanism is highly important since the multiplication rate of alstroemeria is very low, viz., 1.2 – 1.8 per culture cycle. Scientifically, apical dominance in alstroemeria is also very interesting. Alstroemeria plants have two types of major apical tips, the tip of the vertically growing shoot and the tip of the horizontally growing rhizome. In the stem, the former is located 'above' and the latter 'below' the inhibited axillary bud. We found that both meristems inhibited outgrowth of the axillary buds since excision of both promoted outgrowth. In addition, both tips acted via auxin, since replacement of the tips by lanoline with IBA restored apical dominance.
In alstroemeria, research using mutants and genetic engineering with selected genes are not feasible. Therefore we applied fluridone, a herbicide that inhibits carotenoid biosynthesis. The application of fluridone strongly increased outgrowth of axillary buds (Fig. 3, left). In agreement with the model discussed above which states that the increase of axillary bud outgrowth is caused by increase of the capacity to transport auxin, application of the auxin transport inhibitors NPA and TIBA reversed the effect of fluridone (data not shown). We have observed increased branching brought about by fluridone also in apple (Fig. 3, right), eucalyptus and zantedeschia.

Applications in tissue culture

Micropropagation of many crops is based on forced outgrowth of axillary buds. Outgrowth is caused by addition of cytokinins and incidentally by removal of the apex or by addition of auxin transport inhibitors. There are at least three major problems which may be solved to some extent by the new regulator. The first problem is that the axillary bud remains blocked. This causes poor propagation rates such as in alstroemeria. Strong apical dominance may be broken by addition of fluridone. When plants are treated with fluridone, they become white because of bleaching of chlorophyll, because of the inhibition of caretenoid biosynthesis. Surprisingly, fluridone seems to have no other major side effects. Nevertheless, because of bleaching fluridone may only be used in tissue culture in which photosynthesis may be fully replaced by sucrose added in the medium.
The second setback is that apical dominance is not restored after tissue culture leading to bushy plants. Some cultivars of zantedeschia for example may show this 'epigenetic' off type (Fig. 4). Uncontrolled branching after tissue culture may be inhibited by the strigolactone analogue GR24.
The third problem is that cytokonins have undesirable side effects such as loss of the chimeric structure of the mother plant or hyperhydricity. These problems may be overcome by replacing cytokinin partly with fluridone.

Harsh climate requires tailor-made products

Hajo Strik

Most large seed companies have a foothold in Turkey. Especially Antalya is popular and this clearly is the seed city of the country. However, it is not only the major players that produce seeds for the Middle Eastern growers. A small company such as Rossen Seeds is able to serve niche markets by meeting very specific local requirements.

Selecting and producing vegetable seeds that meet very specific regional characteristics. That was the goal Toni Rossen and Pieter Veldhuijzen van Zanten set themselves, when they started the company Rossen en Co in the seventies. Rossen had extensive experience in Eastern Europe, Russia and the Middle East. The latter became their target region. When Jack Lekkerkerk took over the part of the company that was focused on vegetable seeds he renamed it Rossen Seeds. Today, nearly thirty years after its founding, the company still focuses on vegetable seeds that have the uncommon characteristics growers in the Middle East prefer. During the first thirty years, the company introduced new varieties obtained by selection. A decade ago however, his son, Arjan Lekkerkerk, joined the company and started cross-breeding, adding hybrid varieties to the company's product range. In 2006, Rossen Seeds started to co-operate with the Dutch Seed Group International in order to include open pollinated varieties into the portfolio.

Improving yield

Developing varieties for a very small and specific geographical area is usually considered to be non-profitable. General manager, Jack Lekkerkerk, points out that it is exactly that business consideration that led to founding Rossen Seeds. "We met local farmers and co-operations in remote areas, where the lack of education and knowledge led to non-effective use of seeds and, thus, to disappointing growing results. An example? Broadcast sowing of tomato seeds in the hope that at least some of the seeds would germinate was not unheard of." Mr. Lekkerkerk started horticultural courses and advised individual growers how to improve their yield. "It helped us too, you know", he adds. "The intensive contacts with these growers taught us a lot about local growing conditions." The two-way communication between a seed company and growers is uncommon in countries such as Russia, Turkey or, for instance, Iraq and other Middle Eastern areas. "But to be successful in a niche market, it is an absolute condition that all characteristics of the product meet the demands. It makes a company very vulnerable to errors due to the high expectations of the customer." In the Middle East, it is furthermore important to be present in person and to be recognised as someone trustworthy. The Arabic expression 'first be friends and then do business' speaks for itself. Rossen Seeds' commercial manager, Arjan Lekkerkerk, emphasises this. "Rossen Seeds is primarily considered to be a company that is more than just a supplier and that is truly involved. We are as interested in the growing results as the grower himself. In order to avoid miscommunication and to add extra local support, we have chosen to appoint local agents. They have to be recognised locally or nationally as reliable experts. It does not mean that we do not visit the countries ourselves anymore, as we still want to have those personal contacts. The agents are supporting the company in a true partnership. All business is personal in every aspect, in my opinion."
We have three distributors: Yucebas Tarim Ltd Sti, Pelit Tarim Muhendislik San. Vetic Ltd Sti, and Beta Ziraat Ve Ticaret A.S. Their local knowledge and superior service is well-known throughout Turkey. They are also the driving force behind our 'open days' during the ISF Congress, when Jack Lekkerkerk and our breeder want to show our varieties to the delegates."

Breeding goals

Rossen Seeds breeds new varieties based on the local land races. The indigenous varieties are adapted to the local situation and farmers are more or less used to them. They know what to expect when these varieties are grown in their own traditional way and are able to anticipate how large the harvest will be.
The growing conditions can be extremely harsh. "Imagine a temperature of 30°C by day and 0°C by night", says Jack Lekkerkerk. "In parts of Turkey this is the usual situation, having a continental steppe climate. But Syria, Iraq and Lebanon are also regions where the yields remain low due to the climate. A tailor-made selection will improve that. Take our pepper hybrid 'Vural'. It continues to grow during the winter, producing extra kilos during spring and, hence, improving the total yield." Another example he mentions is tomato ADR 311, which attains a solid red colour, even when the nights are cold. For the Mediterranean short cucumbers, it is the size that matters. "In some parts of the country, growers prefer a cucumber with a length of 17 cm, whereas elsewhere they like a slightly longer fruit of 22 cm. We serve both markets." He adds: "Our strength is that we are willing to create a variety for every region, however small. In fact, it might turn out to be a variety for just one grower in that specific climate and soil zone." However, it is not always necessary to create new varieties to meet the demands in a certain region. Hendrik van Isselmuden, manager of Dutch Seed Group International, discovered that breeding material already available at Rossen Seeds could easily be introduced in regions where his company is active. "Think of me as a matchmaker, launching varieties in a region that have already proven their worth elsewhere, but in comparable circumstances", he says. "The knowledge of local demands that the Dutch Seed Group provides, is combined with the product assortment of Rossen Seeds, thus finding the right product for the right niche in new regions."

A broad assortment of vegetable seeds for niche markets in the Middle East is what Hendrik van Isselmuden, Jack Lekkerkerk and Arjan Lekkerkerk (left to right) focus on

Service

According to Arjan Lekkerkerk, Rossen Seeds is supplementing the large seed companies, rather than competing with them. "We focus on growers in the more difficult climate zones that produce for local markets. Rossen Seeds uses the moderate seasons to select and harvest locally, and only when temperatures rise high do we use our facilities elsewhere. This could also be offered to our colleagues, as we are able to expand seed production at short notice. Furthermore, we are equipped to pack and label seeds, even small quantities if necessary. For most seed companies, handling such small amounts would not be cost-effective. We offer this as a service to them."

Minimum Distances

Solution page 25

Phalaenopsis

Variety 1 compared to variety 2
The sepals are more downward
The petals are more downward
The lateral lobes of the lip are less erect
The dorsal lip is less intense purple

Variety 1 compared to variety 3
The petals are more downward
The petals are less kidney shaped
The lateral lobes of the lip is less broad
The dorsal lip is smaller
The whiskers are smaller

Variety 2 compared to variety 3
The sepals are more upwards
The petals are less kidney shaped
The lip is less yellowish
The whiskers are smaller

Butterhead lettuce
Variety 1 is darker, stronger, has blistered leaves and a stronger degree of overlapping of upper part of leaves of head (earlier harvest maturity) than variety 2

Lollo rosso
Variety 1 is a smaller plant, is more coarse lobed and has less glossy leaves than variety 2

TAKII SEED : HIGH QUALITY, RELIABLE, INNOVATIVE

A grain of seed packed with great potential turns into a plant with exceptional characteristics and eventually produces an excellent crop....
We consider this to be "high quality seed"

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