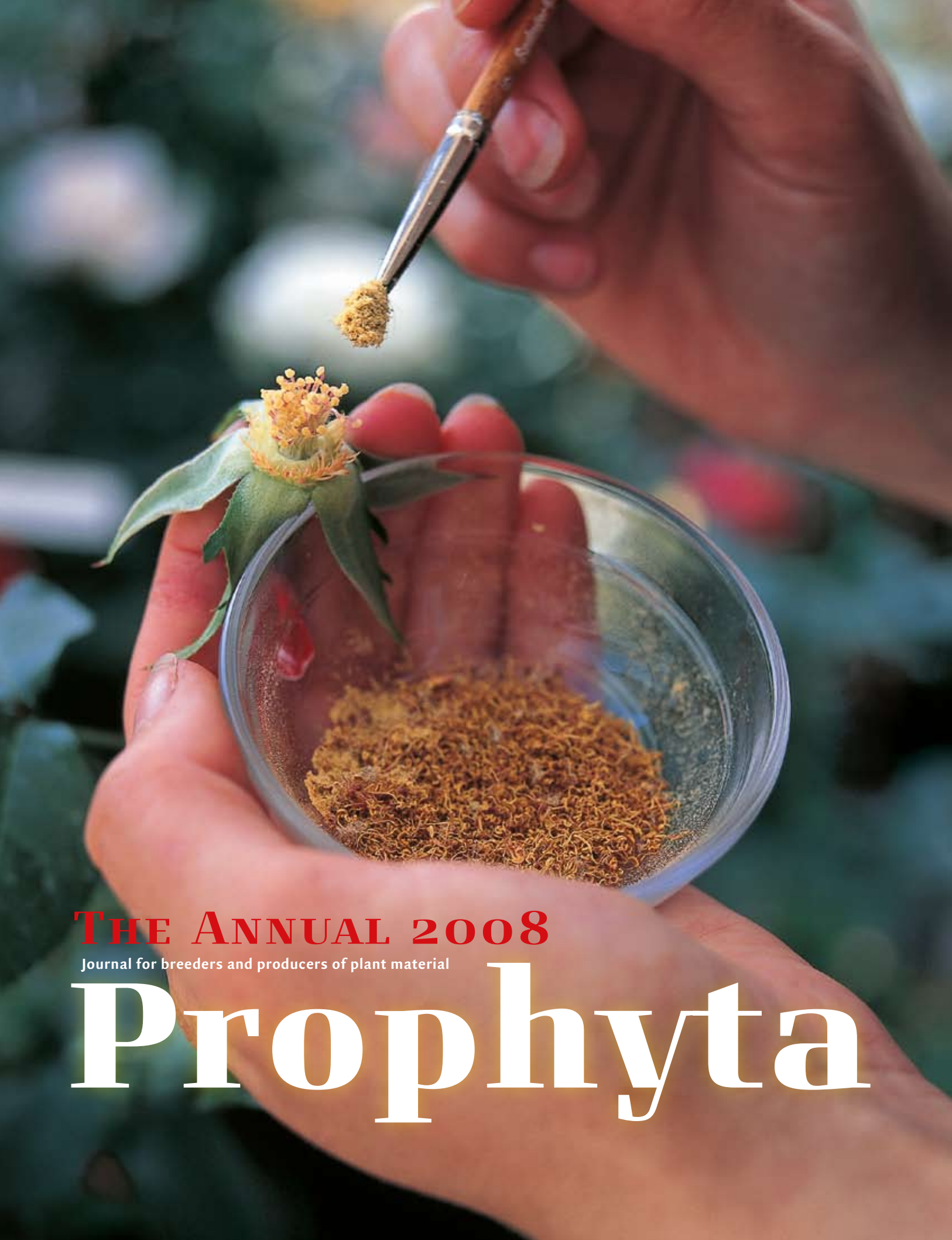

The Annual 2008

Journal for breeders and producers of plant material

Prophyta

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Contents

Fleuroselect presents Gold Medal Winners 2009

‘Ballerina Red’ and ‘Ballerina White’ are all-round performers for a multitude of audiences

Fleuroselect has recently presented its 2009 Gold Medal Winners. This year three new varieties received this award for novelties that clearly surpass any existing varieties in terms of breeding innovation and beauty. The independent expert judges have chosen Prunella grandiflora ‘Freelander Blue’ from Clause and the Armeria pseudarmeria ‘Ballerina Red’ and ‘Ballerina White’ both from Kieft Seeds, Holland.

Sea thrift

For the first time in Fleuroselect history, two innovative Armeria pseudarmeria varieties made it to the Fleuroselect judges’ Gold Medal honours list. The judges were particularly impressed by the pack performance of both Armeria pseudarmeria ‘Ballerina Red’ and ‘Ballerina White’ followed by an excellent garden performance. These wonderful new varieties are early and produce an abundance of beautiful ball-shaped flower heads on short, strong stems. These first year flowering perennials have increased compactness and uniformity in their plant and flowering habit. To top it all, they are heat tolerant.

The name Armeria is derived from the Latin word for Dianthus referring to the plant’s resemblance to Dianthus. Armeria Pseudarmeria means false Armeria. Armeria pseudarmeria belongs to the Plumbaginaceae family and is native to Portugal. It goes by the common name of ‘sea thrift’. This variety is a very common, conspicuous and beautiful member of the coastal flora, found both on rocks and in salt marshes. Sea-thrifts are maritime climate flowers, unhampered by salt when growing near the ocean.

‘Freelander Blue’ produces an exceptional, compact carpet of colour for a long flowering season

Self heal

For the second time Clause has managed to breed a Gold Medal winning Prunella grandiflora, this time with ‘Freelander Blue’. In 2006 the company already received a Gold Medal for ‘Freelander Mixture’. Besides being compact and uniform, ‘Freelander Blue’ flowers early and in great profusion from May to October. This compact new variety is a vigorous, hardy perennial that is excellent for the front of borders. The ‘Freelander’ series is a real value-for-money range; once planted, it will provide the consumer with a carpet of colour for many years to come.

Prunella grandiflora is native to Europe. The plant originates in the mountain areas of the Alps and the Dolomites. In the wild, the colour of the flowers is usually violet blue. It goes by the common name of ‘self-heal’ due to the fact that the foliage of this plant was used as a remedy to stop bleeding in the Middle Ages.

Takii strengthens position

The Japanese based company Takii has strengthened its position on the world flower market. Early this year it acquired the Danish company Global Flowers. This company is specialised in breeding high quality flower varieties of pot plants, bedding plants and cur flowers for the professional market. Its main products are Begonia semp. Gerbera, Lisianthus and Primula and it exports the flower seeds to more than 60 countries worldwide. In September last year Takii took over K. Sahin Zaden. The company, established by Kees and Elisabeth Sahin in 1982, is renowned worldwide as a dynamic flower breeder. Elisabeth and her late husband Kees developed a wide product assortment. It is the company’s signature achievement to successfully introduce new species and novel genetic traits previously unknown to the market. Besides F1 hybrid Delphinium, sunflowers and violas the company produces a large range of first year flowering perennials en garden annuals.

Monsanto takes over De Ruiter Seeds

Monsanto and De Ruiter Seeds Group have come to an agreement regarding the sale of the De Ruiter Seeds. With this acquisition, Monsanto has become one of the leading companies worldwide in the protected-culture sector. De Ruiter Seeds specialises in breeding cucumber, pepper, melon and rootstocks for tomato culture . Monsanto paid 546 million euros to buy the Dutch-based company. The acquisition still has to be approved of by the authorities. Monsanto aims to increase its turnover in the vegetable and fruit seed sector to over a billion dollars. De Ruiter Seeds is to become Monsanto’s centre of excellence for vegetable seeds in protected sector, while Seminis will focus on the open field vegetable market. A third company, the International Seed Group Inc. will serve customers of regional seed businesses. De Ruiter Seeds was one of the last remaining family-owned seed companies in the Netherlands. It was founded in 1945, immediately after de second world war by Wouter de Ruiter. He set up a small company that produced seed potatoes and other agricultural and horticultural seeds. Soon after, he added breeding and the selection of varieties to his activities. Among the early successes were ‘Sporu’ a cucumber variety that is resistant to Spot Virus and ‘Sonato’ a tomato variety resistant to Tobacco Mosaic Virus. Last year the company had a turnover of 108 million euro and 900 employees in 15 countries.
CEO Biense Visser, who will be in charge of Monsanto’s protected cultures segment, believes that De Ruiter Seeds will add to their profit now it has access to Monsanto’s molecular and breeding technologies. It will give us the opportunity to accelerate the delivery of new and approved varieties. Moreover, we can accelerate regional expansion to Asia and South America.

Optimally guarded

When in 1991 a revised UPOV convention came into being, breeders believed that their rights were optimally guarded. Even more so as there was a special stipulation for mutants and genetically modified varieties. If the phenotype of a new variety has all the essential characteristics of an earlier variety except for one, it was supposed to be essentially derived and the holder of the original variety could claim compensation. It was meant to protect breeders from growers accidentally finding a spontaneous colour mutant in their fields or from scientists adding a single gene to a protected variety. Since the start of UPOV in 1961 breeders of vegetatively multiplied species had insisted that additional regulations were needed. In 1991 they finally were accommodated.
Soon however, it became clear that the concept of essential derivation it is not easy to define. Since the introduction, the discussions therefore never have stopped. Ten years ago, the debate flared as maize breeders proposed to consider varieties as derived, if they have a genetic conformity of over an agreed percentage. Today, 17 years later, the debate has been rekindled again as Ciopora published a position paper in which they imposed a threshold of 0.90 for all vegetatively multiplied ornamentals and fruit species. A new variety that differs less than 10% from an existing variety, is supposed to be essentially derived.
Besides, the concept of essential derivation is broadened to contain even varieties that are obtained by normal breeding activities, such as back-crossing and selection. If the association gets its own way, it will restrict a crucial fundamental of the UPOV convention, namely breeder’s exemption. And breeder’s exemption is the driving force behind the continuing improvement of varieties. It is too valuable an instrument for progress to let go of it.
Ciopora claims that the views expressed in this position paper are shared by the majority of breeders of asexually produced ornamental and fruit varieties. However, many breeders disagree and believe that this goes far beyond the scope of UPOV. Disagreement on such an important topic will have undesirable side-effects. How can judges decide on infringement cases, if the breeder organisations themselves do not agree on what an essentially derived variety is? Without doubt the paper will be one of the major issues to be discussed in Prague, during the ISF World Congress in May. Hopefully the result will be a definition that is acceptable to all.

Infringers caught red-handed

After having been caught once infringing on breeder's rights, growers usually have learned their lesson. No so for the Italians grower Tofanelli Marco who was caught twice illegally producing the popular dark red Mandevilla sanderi hybrid 'Sundaville'® of Moerheim New Plants. The first time, in 2006, Moerheim New Plants received a tip-off that the grower was producing 'Sundaville'. "Over half of our checks are based on clues we receive from informers", says Jeroen Egtberts, manager at Moerheim New Plants. "Every tip-off is taken seriously and is investigated by us." A representative visited the grower who had to admit breaching the law. He promised full cooperation and agreed on paying the license fee, an atonement and compensation for the travel and living expenses. Unfortunately the grower did not expect Moerheim would keep a close eye on him. "It is our habit to check infringers regularly. When we visited this grower in 2007 he again had 'Sundaville' in his greenhouse. This time we were not so lenient and reported the incident to the police." Together with the carabinieri, officials of the Italian Inspection Service and the prosecutor a representative of the company entered the greenhouse. Under judicial supervision the plants were counted and the infringement documented. "We could either take the matter to court or, again, reach a settlement. We have chosen the latter as in our view that would be punishment enough. The grower had to pay all costs, the license fee and a substantial compensation. Furthermore, the matter was publicised in three Italian horticultural magazines. We believe this grower will refrain from any further infringements in future as these plants have become very expensive with all the added costs", concludes Jeroen Egtberts.

Lie detectors

Three years ago another alleged infringer, Biological Industries, appeared to get away with a violation of plant breeder's rights. The case was instituted by the Israeli breeder Danziger, who recognised their Gypsophila 'Million Stars' in flowers that were sold as 'Bambino'. The court in Tel Aviv used a lie detector to decide which one of the parties was right. It was agreed that the manager of Biological Industries should answer one question only: whether material of 'Million Stars' was used to produce 'Bambino'. The manager answered in the negative and passed the lie detector test. Subsequently the case was brought to a court in The Hague, in the Netherlands last year, as this is a major market for growing as well as trading Gypsophila. To substantiate their claim Danziger had assigned Keygene to investigate the matter. The latter is a life sciences company specialising in genetic and genomic research and they compared DNA fingerprints of 'Million Stars' and 'Bambino'. Dr. Anker Sorensen of Keygene declared that the varieties were closely related, more closely than with varieties that are no mutants. Biological Industries protested that the report was not well-founded. The judge concluded that arguments of Biological Industries did not disprove the report and that one of the two varieties was a mutant of the other. Furthermore, contrary to Danziger, Biological Industries was not able to give a credible account of the origin of 'Bambino'. The judge therefore came to the conclusion that 'Bambino' is essentially derived from 'Million Stars'. The company was convicted and had to pay over 65,000 euros as compensation for the costs Danziger had to make.

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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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.

'I expect interesting discussions'

Monique Krinkels

For the first time in the history of ISF and (as new members) the Czech Republic, will host the ISF World Seed Congress. ČMŠSA President Milan Pavlíček is looking forward to the event. "The beauty of Prague and the accessibility of this city in the middle of Europe are strong reasons to hold the congress here. I believe, that the attendance will be better than average as about 1500 participants are expected."

The work involved in organising the ISF World Seed Congress 2008 is not to be underestimated. The Czech Seed Trade Association has some experience in organising similar events as in the past few years for example the Annual Meetings of the Eastern European Seed Network EESNET have been held in the city. "The national organising committee of the ISF Congress is a small, well organised and experienced team that is highly motivated to arrange a successful and worthy congress", assures Milan Pavlíček.

Beautiful location

The capital of the Czech Republic is protected as a designated UNESCO World Cultural and Natural Heritage site. "A walk to (in) the Old Town Square, a visit to the Old Town Hall including the Chapel and the Tower and a visit to the Castle St. Vitus Cathedral are unforgettable experiences for visitors", says Mr. Pavlíček proudly. "The Castle gardens are laid out beautifully. Some of the congress social events are to be held in interesting Prague buildings that are not too far from the Congress Centre. The only thing that worries me is that the traffic can be troublesome." Mr. Pavlíček is looking forward to the Congress. "It is a good opportunity to meet business partners (prefer 'colleagues' as they may well not be partners) and to get information about the seed sector developments the future. The prepared documents of the congress have been carefully studied and all participants can find their own interesting topics according to their specialisation. I expect interesting discussions concerning changes in the ISF Sections organisation and generally in all crop sections."

EU member country

The Czech Republic has been part of the European Union since May 1 2004. "Regarding the seed sector and agriculture the Czech Republic is a very open and liberal country. There is a keen competition on the market. The market share of domestic operating companies has been declining since the accession to the EU. The share of foreign varieties for instance is more than 50% in all cereals. The use of certified seed and other measures has to improve the return on investment of breeding in a country as small as the Czech Republic", explains Mr. Pavlíček. "Breeders' incomes are influenced by the use of certified seed and our ability to collect remuneration from FSS. The current level in cereals is 60-70% of the use of certified seed." His company Oseva Uni, a.s. is one of the largest and most well known seed companies in the Czech Republic. Mr. Pavlíček is working for the company since 1982, after graduating from the agricultural university. The firm Oseva was established in 1954, but when the former state-owned company was privatized in 1994 the name became Oseva Uni. Currently, it is a completely privately owned Czech company with clearly defined business policies and goals. The company's headquarters are located in Chocen in the East Bohemian region. The business activities include breeding, seed production but also the sale of licensed varieties and of other farmer's requisites such as plant protection chemicals and a full assortment of registered fertilisers.

Marketing

"The process of selecting varieties fitting into a production and marketing plan is a very responsible and difficult process", says Mr. Pavlíček. "We must ensure that a sufficient supply of quality seeds is produced, as well as a sufficient lines of varieties. It is also very important to estimate whether farmers are interested in newly registered varieties. Our production plan is always the result of excellent knowledge of the business environment and of course includes a certain amount of professional estimation as well." The company has concluded license and sub-license contracts with all significant plant breeders, both domestically as well as foreign companies who have varieties registered in the Czech Republic. "We are the exclusive representative on the Czech Market for the varieties of a number of foreign plant breeders." The primary production and organisational structure of Oseva Uni, a.s. consists of five branches, where the cleaning, treatment, packaging and certification of seed takes place as well as the subsequent shipping to customers. "The quality of the seed is carefully controlled by our employees during the course of the entire production process, i.e. from the time of growing and delivery of the rough seed at the branch, through the time when it is shipped. Thanks to our accredited laboratories, we are authorised to deliver the seed of some species to customers on the basis of our own analysis and certificates." Oseva Uni works closely with the three partners: Elita semenářská, a.s. in Brno, Olseed, a.s. in Olomouc and Unisev a.s. in Litoměřice. "These companies have the same business policy as our company does, They offer their customers the same assortment of products and even have the same organisational structure. Through our sales team and team of partner companies we cover the entire sales territory of the Czech Republic – we offer and deliver goods to the end customer." Says Mr. Pavlicek(add accent)

Milan Pavlíček: 'I expect interesting discussions concerning changes in the ISF Sections organization'

Two breeding stations

Seed breeding takes place at two stations: Domoradice and Větrov. "Our breeding in Domoradice is focused mostly on clover species, while in Větrov more emphasis is placed on amenity and forage grasses and phacelia. "Our varieties are beneficial not only for the Czech Republic; a whole range is registered abroad, even overseas", says Mr. Pavlíček. "The production and sale of forage and amenity mixtures plays a very significant role for our company. All the mixtures that we offer have undergone thorough testing at our breeding stations. In addition to our standard offer of mixtures, we also prepare mixtures according to our customers specific requirements (mixtures made to order)." he says. The professional mixtures are prepared at the breeding station in Větrov. "The 'VV mixtures' are a reflection of the know-how of our top experts and consist of the best foreign and domestic grass varieties only. You will find our VV-mixtures at an entire range of golf courses and first league football (soccer) fields. The products that we offer in small volume packages are designated for customers of stores that sell garden goods – from supermarkets to small town stores."

The importance of organic products is still marginal for the seed sector in the Czech Republic. However, Oseva Uni also produces the seed for organic farmers. "It is a sector that is supported by state aid and has growing tendency." The same goes for genetically modified seeds. "The acreage of GMO maize was 5,000 hectares in 2007 an increase of about 228% compared to the previous year. The attitude of the Czech people is rather reserved as it is to all unknown, new products." (Was it really 228%?) //

The cradle of breeding still proves its worth

Ladislav Rosenberg

The Czech Republic may truly be named the cradle of breeding, as it is in the monastery in the city of Brno that Gregor Johann Mendel studied the inheritance of traits in pea plants and thus laid the fundamentals of genetics. Today the country has a thriving and competitive seed industry.

Over half of the land of Czech Republic is used for agricultural production, mostly for the growing of cereals. That barley and hop are among the important agricultural crops is not amazing, seeing the country's strong beer brewing tradition. Other important crops are: maize, peas, potatoes, oil seed rape, grasses and legumes. As far as vegetables are concerned, cabbage, cauliflower, tomato, cucumber, onion and lettuce should be mentioned. The consumption of vegetables used to be much lower than in Western Europe, but the Czechs are catching up quickly. There is a long tradition in fruit growing. Apple, pear, sweet cherry and apricot are quite common trees in the Czech countryside. And besides there are the vineyards covering the hills in South and Middle Moravia.

Seed association

Contemporary Czech breeding continues in the same tradition as its predecessor breeding companies, inaugurated at the beginning of the last century under the guidance of prominent Czech agricultural specialists. Thousands of varieties which have helped in advancing plant production have been developed and registered in Czechoslovakia (what was later to become the Czech and Slovak Republics) and also in many other countries for almost a hundred years. The seed sector development after 1948 lead to the establishment of two large state plant breeding and seed production enterprises: Oseva in field crops and Sempra in horticultural crops. After 1990 both companies were divided into several smaller private enterprises and besides that several new seed trade companies have also been established. Nowadays there are about 600 registered enterprises, that have the opportunity to enter and expand in the seed market. They differ in size, range of crops and range of activity. Beside plant breeding and seed companies there are several research institutes, some of those are also private. Business relations are based on free market principles. Private plant breeding companies and seed companies have a common interest in many aspects. That is why they have created the Czech Seed Trade Association (CMSSA) in 1992. It is the official representative of the seed sector to the state bodies, it has own share of the responsibility in a creation of the legislation and in establishing of conditions to realize that and in a particular technical rule details making. The Czech Seed Trade Association supports the important role of the private seed sector in the protection of the intellectual property, the seed control schemes as well as in the variety testing processes considering that it is a way to make those processes quicker and cheaper for the private seed companies. Very important part of the activities is the initiation of the remuneration collecting from farmer's saved seed (FSS). The formation of a new organization, Co-operative of the Variety Owners (CVO) was the result of this activity. CVO was founded in 2001. The first remuneration was administrated and successfully collected in 2002 and contemporary income from FSS is important source for the breeding financing.

Ladislav Rosenberg is secretary general of the Czech Seed Trade Association (CMSSA)

Land use

total area	7,886,702
forest	2,649,149
water	161,421
building area	130,195
agricultural land	4,254,406
other land uses	679,000

Agriculture

Category	Area (ha)
arable land	3,039,550
hop	10,844
vineyards	18,907
permanent grasslands	976,225

Crops and yields

Crop	x 1000 ha	t/ha
wheat	811,0	4,86
rye	37,5	4,73
barley	498,7	3,80
oats	59,0	2,7
grain maize	111,7	6,8
triticale	50,1	4,14
other cereals	11,5	3,63
oil seed rape	337,5	3,06
sunflower	24,4	2,13
poppy	56,9	0,58
oil flax	2,25	1,57
sugar beet	54,3	53,2
potato	31,9	25,7

Czech varieties of pepper are successful in other Central Europe countries

More than half of the cereal varieties is foreign

Competitive environment

The position of the Czech varieties is influenced by the keen competitive environment. This competitive situation is stronger than in the neighbouring countries. The reason is the attractiveness of the Czech market according to law functionality, enforcement of the breeding right, above-average usage of the certified seed and level of royalties. In spite of this keen competition, the Czech varieties take an important position in the range of the marketed varieties. The domestic market has a decreasing trend and breeders have to expand the Czech varieties abroad. With regards to variety listing, the Czech Republic is a very open and liberal country without any protective tendencies. Forward-looking Czech market, prospective affiliation with EU and functional legislative of IP attracted all important foreign seed companies. There is a keen competition on the market and the market share of domestic companies has a long term falling tendency. The share of foreign varieties is more than 50% in all cereals. The situation is much more critical for winter barley where the acreage of cultivation is very small and represents only ten or twelve thousand hectares for domestic varieties. The decrease in the acreage of domestic varieties within the period 2000-2007 is much higher in seed production than in the share of listed varieties as result of the better marketing experience and power of the international seed companies. The unfavourable balance of the Czech seed export of the field crops is caused by the competitive environment and to the weak capability of the Czech companies (not too well provided with capital), to expand business abroad. The vegetable breeders are more successful and the appropriate proportion of the export/import is balanced.

Seed production development

Crop	Seed production (x1000 ha)		Seed production (x 1000 t)		Index
	1998	2006	1998	2006	2006/1998
winter wheat	42.4	36.5	84.5	101.2	1.20
spring wheat	4.3	3.2	11.2	8.7	0.78
spring barley	24.1	20.6	29.0	46.6	1.61
winter barley	8.4	5.3	16.0	14.6	0.91
winter rye	3.54	0.6	3.4	1.0	0.29
oats	3.8	1.8	2.9	2.7	0.93
triticale	1.3	2.1	2.6	2.9	1.12
maize	0.6	1.0	0.8	1.1	1.38
field bean	0.6	0.3	0.6	0.3	0.50
field pea	7.5	3.3	6.2	5.4	0.87
red clover	7.9	5.9	1.0	1.1	1.10
winter oil seed rape	1.1	0.3	1.8	0.4	0.22
poppy	0.3	0.5	0.1	0.1	1.00
flax	1.6	0.9	0.6	0.1	0.17
mustard	7.5	9.6	3.4	5.4	1.59
grasses	15.7	18.1	7.3	9.7	1.33
potato	4.2	2.7	41.9	55.4	1.32

Exporting seeds

The national variety lists are the base for the EU common catalogue of varieties, which nowadays includes also the varieties registered in the Czech Republic. On the basis of this list it is possible to trade the varieties in EU territory. However, most of the farmers prefer varieties registered in their home country, therefore remains the national registration of field crops, based on VCU testing, presumption for varieties trading too. The Czech breeding companies have registered abroad plenty of varieties. The majority of them are protected, at least in particular state's national protection frame. For example Czech barleys dominate on Slovak seed production areas. Czech oat varieties are very successful in Germany, varieties of pea and wheat are just in minority abroad. The Czech breeding of Festulolium grasses is well appreciated abroad, varieties of the red clover and also varieties of the white mustard are very well known and their seed production is important part of the export. Czech varieties of pepper, sweet red pepper, parsley and garden pea for processing unambiguously exceed on the Slovak seed multiplication and they are also successful in other Central Europe countries, in particular in Poland and Hungary. //

Eastern Europe offers huge potential

Bejo was founded in 1978, so this year marks its 30-year anniversary as a vegetable seed company. The company is primarily active in the market for outdoor vegetable seeds. But long before its start, the first steps into the enormous and challenging Eastern European market were taken by the parent companies of Bejo: Jacob Jong Zaden (founded in 1899) and Cornelis Beemsterboer Zaden (founded in 1928).

The company began by attending fairs and exhibitions, making contacts with breeding institutes, and simply visiting the farms and fields in the region. "Obtaining visas was not always easy, and the long traffic jams at Berlin border crossings like 'Checkpoint Charlie' made you wonder what was on the other side of the wall", says Siem Beers, area manager Eastern Europe. Bejo soon realized there was a huge potential in Eastern Europe for their product line, especially for the brassicas, carrots, onions and red beets, and later for gherkins and outdoor tomatoes. "These vegetables are very popular in Eastern Europe, for example in traditional dishes like borsch, the popular Russian soup."

Long tradition

Historically, many Eastern European countries have a long tradition of agriculture. "Family farms were passed from father to son, and countries like Poland and Romania used to have numerous small farmers. In fact, Poland previously had around 2.3 million registered farms! Nowadays, the number of farms is decreasing as farm size increases. In Poland today, 80% of the total vegetable production is grown on approximately 70,000 farms", explains Siem Beers. Of course, the former Soviet Union had a different history. After the fall of the Berlin Wall in 1989 and the final collapse of the Soviet Union in 1991, massive privatisation took place. The former *sovchoses* and *kolchoses* were either transformed into private organisations or disappeared altogether. "Today's farms in the Russian Federation are large-scale vegetable producers, with professional management and substantial investments in techniques and hybrid seed. Nowadays, vegetable production farms of 2,000 ha are common."

During the renowned open days farmers compare their experiences

Distributing

Bejo built an extensive distribution network in Eastern Europe over the years, and after the changes in 1989 began to deliver their products to all Eastern European countries. "In most of Eastern Europe, seeds are commonly sold through seed shops. Many of these shops have turned into 'garden centres' that often carry equipment and chemicals for the professional growers, in addition to seeds. The combination of growing products and growing advice is a good solution for the farmer."
Siem Beers: "Local representatives of Bejo often visit large production farms to sell seeds and to give advice on agronomy. The introduction of new varieties is often one of the topics that comes up, although this can also lead to problems. One such problem was the registration of varieties in almost all Eastern European countries in 1989 after the fall of the Berlin Wall. Registration was a long and slow process which made the introduction of the newest hybrids more complicated. Of course, this is no longer an issue for EU Member States, since they have accepted the EU Common Catalogue, but for non-EU countries it is still a topic for discussion."
Another problem is the ISTA certificate for vegetable seeds. Although this certificate is suitable for major agricultural commodities, it is unsuitable for the daily delivery of specialty vegetable seeds to daughter companies and dealers. In the latter situation it is impossible to wait a month for such a certificate to be issued.

'Local representatives of Bejo often visit large production farms', says Siem Beers

Efficient logistics

Bejo was the first European company to obtain the NAL accreditation (*Naktuinbouw* Accredited Laboratory) in 1996. This opened up the possibility of issuing NAL company certificates in real time, a practice which was a blessing for Bejo customers in Eastern Europe. This resulted in the acceptance of the certificate in Croatia, and Kazakhstan, for example. Meanwhile, many Eastern European countries have accepted the NAL system. As a result, "Bejo logistics have become very efficient. Unfortunately, several countries, such as the Russian Federation, have not yet accepted the NAL 'non-stop' system, and this hampers the trade and logistics. Hopefully this issue will be given priority on the agenda of the Russian and Dutch Ministries of Agriculture in order to speed up this process and to get the NAL system accepted in the Russian Federation."
Currently, Bejo has eight locations in Eastern Europe where more than 100 people work full time in breeding, production and sales. At the Bejo facility in Poland, plastic tunnels are being erected and increased breeding activities are taking place. This is the location where Bejo's current gherkin programme began, resulting in high European market shares for this crop.

Harvested area of cabbage carrot and onion in 2007

Source: FAO

	Cabbage	Carrot	Onion
Poland	35,500	28,700	31,250
Hungary	3,700	2,578	5,158
Czech Republic	2,780	3,152	3,856
Russian Federation	88,600	75,800	95,000

Cooperative approach

The world famous Open Days are an excellent example of Bejo's cooperative approach. Especially for our customers from Eastern Europe, these events are a great opportunity to meet with colleagues from other countries and to learn about the newest Bejo varieties and the latest developments in machinery and agronomy. In addition to the Open Days in Warmenhuizen, the Netherlands, Bejo used this

In Poland 80% of the total vegetable production is grown on approximately 70,000 farms

successful 'open days' formula in the 1990s in Poland and Hungary, and is currently using it to organise Open Days in numerous other countries. This gives thousands of farmers, packers, traders, supermarkets, industries, institutes and local advisers the opportunity to see the latest developments firsthand. "Bejo is ready for the future in Eastern Europe with its newest developments in breeding such as leek hybrids, *Xanthamonas*- and *Fusarium*- resistant brassicas, storage carrots, mildew-resistant storage onions, tomatoes for protected and outdoor production, gherkins and cucumbers, and of course, the traditional Eastern European crops such as root parsley, celeriac and radish hybrids", explains Siem Beers. To improve its sales force and distribution network, Bejo established two new companies in 2006: Bejo Ukraine and Bejo Romania. Furthermore, the acquisition of an onion set company, Broer, and the introduction of the Quality Inside label strengthened Bejo's position on the onion set market. "It is obvious that the activities of the larger processing industries are moving from Western Europe to Eastern Europe, and Bejo is ready for this development. There is special attention in the product line for the carrot juice and concentrate industries. Bejo is working with these industries to develop better varieties with a higher yield and with the focus on health benefits." //

Accredited laboratories

NAL is a system set up by the Netherlands Inspection Service for Horticulture, Naktuinbouw, for the accreditation of private seed laboratories. The purpose of the system is the creation, maintenance and recognition of the desired reliability of the seed lab, measured along the conditions of a prestigious standard resulting in progress on effectiveness (less repetitions, mistakes etc.). A good functioning seed lab is a necessity for every seed company to build up a defence for liability. NAL has an impact on all critical aspects of the testing of seeds on quality; sampling procedures, the quality assurance system of the laboratory, and the expertise of the annalysts, the testing protocols and the release of the results. The aim is to generate an effect as great as possible for the seed laboratory so that at the end the ideal situation of a 'one stop testing' system. That means that the results of the NAL-accredited laboratories are accepted by the clients without interference of third parties (such as state laboratories). To realize this ambition time and effort appeared to be necessary. The NAL-accreditation is possible for every quality aspect of seeds: germination, moisture content, analytical purity, seed health, resistance- and gmo-assessments, but also usable plant tests in soil. This wide scope was chosen on purpose, in order to have maximum value of the accreditation. nal is a tailor made system for vegetable and flower seed companies, multinational operating with the focus on solidity and reliability. Since the nal-seed was sown together with the seed company Bejo in 1993, NAL developed continuously and will develop further. The knowledge collected in the nal-accreditation system is on line available for the NAL accredited companies.

10 Questions to the present and former secretary general

Monique Krinkels

Hurrying across the trade floor to an appointment elsewhere, rushing delegates inside an assembly hall in order to punctually keep to the schedule, presiding over meetings with amazing efficiency, Mr. Bernard le Buanec will not easily be forgotten. For 15 years he held the position of Secretary General of ISF. He leaves his successor Marcel Bruins head of a well functioning secretariat, a blooming, united organisation and an industry that stands, certainly partly due to his endeavour, firmly on the map.

10Q2 Bernard le Buanec

1 What was your very first job (as a student)? "My first job as a student in 1961 was an internship at the French National Institute on Agronomical Research INRA, where I studied the Arginine metabolism in vegetables roots. The second in 1963 was an internship in a small farm of mixed farming in Brittany. In fact a summary of my life: research and agriculture and a link to my roots, Brittany."

2 In what country was the first FIS or Assinsel congress you ever attended? "My first FIS/ ASSINSEL congress was in Cannes, in 1980."

3 The past 15 years have been very busy for you. Was it difficult to find a balance between your private life and work? "Not really. My three children were grown up and my wife has been able to travel with me many times. However, I have to say that she has been very understanding about my crazy business schedule."

4 Which country that you have visited during the past 15 years was most different from what you had expected? "I have always prepared my travels in advance and have good information about countries before visiting them."

5 You are a very energetic person. What is your secret how you manage that pace? "Rigour and discipline."

6 Do you have a favourite flower? And a vegetable? "No, I have no favourite flower. I like all flowers particularly in a garden or in the wild. I happened to make long trips only to see flowers. I have no favourite vegetable either."

7 Next to whom would you like to sit in an airplane and why? What would you like to discuss with him/her? "My preference is of course to sit next to my wife. When this is not possible my preference is to have nobody next to me. My preferred topic for discussion is travel experiences."

8 I don't expect you have had much time for hobbies these years, but do you have a hobby? "Yes I have hobbies: travelling fortunately, gardening but rather scarified the past 15 years, reading, listening music and walking."

9 Will you still have official functions in the future? Anything in the seed business? "Yes I will have official functions in the future in the framework of my work for the French Academy of Agriculture and the French Academy of Technologies of which I am life member. I am also honorary life member of ISF and AFSTA and they won't get rid of me easily. I have also been contacted by some international organisations for consulting."

10 What do you expect you will miss most? "The regular contacts with friends from all over the world."

10Q2 Marcel Bruins

1 What was your very first job (as a student)? "During my university period I worked as a student trainer several times, assisting lower grade students with their laboratory and field experiments."

2 In what country was the first FIS or Assinsel congress you ever attended? "Bangalore 2003. A very memorable congress, as the Iraq war had just started, and SARS was wreaking havoc, so many people cancelled their registration and participation was lower than expected. Nevertheless, among the participants that did show up, there was a very heated debate about the draft consolidated IP position paper. So this was certainly a congress not to forget."

3 The next years will be very busy for you. How will you find a balance between your private life and work? "That is probably going to be one of my major challenges. Obviously I start at a different phase in life than my predecessor Bernard did. I have three children (ages 6, 3 and 0) and I wish to be a father who - when he is in the country -, is at home for dinner and put his kids to bed. If I can I take one or two to school in the morning. Because I am away so often, I also wish to keep the weekends free to spend with my children. This means I will have less time available than Bernard. I try to compensate by working often in the evenings till midnight, as luckily I don't need much sleep. With a permanent staff of five I believe ISF is seriously understaffed, with all the work we have on our plates right now. Fortunately the board of directors has agreed to hire one additional staff so we will start the hiring process soon."

4 Which aspect of the seed industry is most appealing to you? "The fact that seeds are the start of everything. All food, feed, fibre and many other applications start out with seeds first. To be able to be part of and steer the optimisation of these different chains is tremendously appealing, but it also comes with great responsibility."

5 Do you have a favourite flower? "There are many beautiful flowers, every genus has one or more attractive varieties, but if I would have to choose one, it would be the iris. It's the combination of the very showy flowers, combined with a certain exotic and hidden mystery that makes them almost irresistible. I love gardening and had collected several iris species and varieties in my garden in Wageningen. The genus also comes in a vast array of colours, from brilliant white to almost black (hence the name, originating from the Greek word for rainbow).

6 Do you have a favourite vegetable? My favourite vegetable...? Hmm, let me think. I think I like them all, as all of them have one or more healthy components. But if you make me choose I would tie broccoli with carrots on a shared number one spot."

7 Next to whom would you like to sit in an airplane and why? What would you like to discuss with him/her? "Very easy: my wife and three kids, because it would mean that I get to share more time with them. The things I would like to discuss would be all the great things we are planning to do when we get there."

8 Do you have a hobby? "If you consider a hobby as an recreational activity one would pursue during one's spare-time, it would be clearly be my spending time with my family. If you're asking about the more 'traditional' hobbies, no, not anymore. I used to spend a fair amount of my spare time on photography, gardening and sports, but now with my very busy and irregular travelling schedule it is almost impossible to pay a regular visit to the gym or another club. The schedule also makes the planning of social events more difficult. The other day a friend of mine from abroad wanted to come over and visit one or more soccer games during the European championships which takes place in Switzerland and Austria this year. We could not find a date when I was in the country for one of the more interesting matches. Too bad. I'm sure it will all come back in the future."

9 What is your favourite holiday destination and why ? "Probably Italy, as my wife is Italian. Over the years I have learned to speak the language fairly well, and have seen very beautiful spots of that country that we really like to go back to, e.g. Sardinia, or some of the small villages in Umbria. On top of that, Italian food has become my favourite choice around the world. But of course there are also lots of places outside Italy that I really would like to visit."

10 When was the last time you went to the movies and what film did you see? "The last time I went to the cinema was during the last Christmas holidays. I went to see the movie 'Ratatouille' with my two oldest children. Great movie, loved it." //

Climate change is also affecting breeding

Annet Lamers

Weather and climate have an important influence on breeding results. The present climate changes are causing a shift in focus for some breeding programmes. "The development of a variety that is as non-responding as possible to extreme weather conditions will be the challenge of the future", says Stefan van der Heijden of Barenbrug. "Today, stability has more priority in breeding."

It has been proven scientifically that the climate is changing. In 2007, the Intergovernmental Panel on Climate Change (IPCC), the climate panel of the United Nations, presented its fourth Assessment Report (AR-4). International teams of scientists have been working on this project for years. For Europe, it was the first time that it was proven scientifically that climate change has visible effects, such as shrinking glaciers, extended growing seasons and a shift in geographical growing areas of species towards the North. The consequences of climate change are becoming more and more significant for nature, people and society. This process is also affecting plant breeding.

Testing on more locations

The risk of extreme weather conditions has become a more important factor. The recent decennia have clearly shown more extremes in precipitation quantities. The total amount of rainfall during a year has not changed that much, but there are more short periods with heavy rainfall or unusually high temperatures, which are very challenging for crops. As a result, the crops have to be more stable in these variable circumstances. It is exactly because of these increasing differences in weather conditions that many breeding companies have established more testing facilities in different countries. "The only way to get a grip on the stability of a crop is by testing the genetic material at various locations", says Stefan van der Heijden, global research director of grass and fodder crops for Barenbrug. "We try to test our varieties in a wide range of circumstances, which are hard to simulate in laboratory tests or by using other indirect methods. That is why we test our crops over a large geographical range – from Northern Ireland to Romania and from Finland to Italy." Sometimes the circumstances in these areas are different from what the company had expected. "Against all odds, the winter in Romania turned out to be less severe than at our location in the South of France. It is this unpredictable behaviour that compels us to use a wider test area in order to be able to select more precisely on diseases and abiotic conditions like in rainfall, temperatures and snow cover. Our main aim is to focus on intensive resistance against drought, heat and cold, while keeping the disease resistance intact." Knowledge about the stability of the productivity of a variety is becoming more and more important in official trials, which should be given more attention. Stability – a minimal reaction of a variety to extreme circumstances – will be the challenge of the future, according to Van der Heijden. "The disadvantage is that it becomes clear only in retrospect how stable a variety is. With annual crops like cereals and vegetables, these effects are less extreme than with biennial crops or grasses. "It is a wonderful challenge for breeders to develop instruments for focussed selection", concludes the global research director of Barenbrug.

'The challenge of the future will be the stability of a variety or the development of a variety that is as non-responsive as possible to extreme weather conditions', says Stefan van der Heijden, Research & Development Director of Barenbrug Holland

Increased risks

Pieter Egelmeers, head of breeding field vegetables of Rijk Zwaan, has also observed climate change. "The weather is clearly different in a number of countries than it was 15 years ago." He mentions the slightly increased temperatures, the earlier start of Spring, decreasing precipitation in Southern Europe and more local rain or snow in North-western Europe. "In countries such as the Netherlands and Germany, we are mainly seeing more rainfall in a shorter period. Changes like these have consequences for growers. Having more rain in certain periods increases the risks. Planting dates and harvesting period become uncertain. Growers are sometimes unable use the machines on their land if the soil is too muddy." In Southern Europe and Morocco, the lack of water is becoming more and more of a problem, according to Egelmeers. "In those areas there is a shortage of good quality water. The competition for water with the tourist and recreation industry, such as golf courses, is a threat in production regions. This is partly because less rain has fallen."

Life cycle

Pieter Egelmeers believes that the climate changes have less influence on the actual breeding of field crops. "We breed our crops in close proximity to the markets where they are sold. If there are changes, we will adapt automatically. The life cycle of a variety is limited. The time from the first crossings until the variety is withdrawn from the market is normally around 10 to 20 years. In such a short period, climate changes do not have a big influence. Consequently, climate change has a limited priority. We have noticed that the weather can be very changeable, and we have been adapting to that situation by testing under various circumstances. If the summer is hotter and there is a lot more rain in the Spring, then the genetic material is automatically tested for that." However, regarding a crop like leeks, he has noticed that winters have become milder in North-western Europe. "Because we constantly select under local conditions, leek varieties may therefore become less resistant to extreme cold. The crops are no longer exposed to that condition." Egelmeers does not think this a big issue. "If we had to produce varieties with product cycles of 50 years, we would have to take more account of climate change. With field crops, it will never be so important."

Search for stable varieties

Paul Degreef, who is responsible for breeding worldwide at Nunhems Seeds, says that this company has been concentrating on the stability of vegetable crops for about the past seven years . "We see that more instability through the seasons is affecting quality, resistance and output. We are now mainly searching for stable-reacting varieties in almost every geographical area, focussing on plant health, drought, differences in day/night temperature and fluctuations during the season. We have breeding stations in Europe, Asia and the Americas, 18 locations in all. In this way we are able to expose our crops to different situations. Crops such as leeks are also tested in the French Alps to be certain we take an aspect like cold into account. You always have to test crops under varying circumstances. This is how we organise our breeding programmes", says Degreef. "Radish, a crop mainly grown in coastal regions, is intentionally tested at inland locations, just to see how the crops respond to less light and a higher relative humidity. We also like to test in areas where there is a higher disease risk for certain crops." Degreef emphasises that the effects inside the greenhouse are comparable to those outside because minor changes in temperature, light intensity or humidity have more impact. "Cucumbers, for example, are stressed by a period of less light, which has a huge influence on the productivity. That is why stable varieties of those crops are so vital." To create varieties that are even more stable, he believes that the next phase will be a more focussed search for different circumstances and the artificial simulation of those conditions. "Stress caused by salinity or drought can be simulated. We want to learn more about root physiology so that we can adapt the varieties better", he adds.

'We have noticed that the weather in a number of countries is different from fifteen years ago, but this has a limited influence on breeding', says Pieter Egelmeers, head of field crops breeding at Rijk Zwaan

Shifts at the micro level

Besides different weather patterns and extremes, there are also shifts at the microclimate level, states Stefan van der Heijden. As a result, breeders have to focus more of their attention on different diseases and pests. "We are seeing other patterns, especially with fungi. The problem of red rust in grasses used to be restricted to the south of Europe, but in the past 15 years we have noticed this disease more and more often in northern and western regions of Europe, for instance in the United Kingdom", says Van der Heijden. "The red rust in cereals is being replaced by diseases such as Fusarium, Septoria and Rhynchosporium

PROPHYTA ANNUAL 2008

IPCC report proves global climate change

In 2007, the Intergovernmental Panel on Climate Change (IPCC), the climate panel of the United Nations, published the fourth Assessment Report (AR-4). International teams of scientists have been working on this issue for years. This report presents the current scientific views on global climate change. The conclusion of one of the IPCC teams is that human civilisation has an unmistakable effect on climate. And it will stay that way for centuries, even if we take measures to limit those effects. More and more research results show that observed changes, like higher average temperatures, a rising sea level and changes in rainfall and extremes of weather, will continue. One direct indication of recent climate change is that the average global temperature has risen between 0.56 and 0.92°C during the past 100 years. That temperature rise is not equally divided over the world: large land masses and the polar areas have warmed up faster than the oceans and the tropics. The 12 warmest years since 1850 have occurred during the last 13 years. Since 1970, the temperature has risen by 0.2°C every 10 years. The most sensitive regions for climate change are the North Pole, sub-Saharan Africa, the Asiatic mega-deltas and the smaller islands. For Europe, this was the first time that it could be scientifically proven that climate change has visible effects such as shrinking glaciers, extended growing seasons and a shift in geographical growing areas of species towards the North. The IPCC team emphasises that emissions of greenhouse gasses should be urgently reduced (mitigation), because global warming will have irreversible consequences. Natural and social systems are approaching the limits of their adaptability.

Consequences for agriculture

A global temperature rise of 1 to 3°C will have a positive influence on crop yields in the temperate climate regions. In sub-tropical and tropical areas, such a temperature rise will probably lead to reduced harvests of the most important cereals. The way these effects will actually occur depends on availability of water, the choice of varieties, crops and adaptive management .A further temperature rise can lead to reduced harvests in all regions.
The increased frequency and intensity of extreme weather conditions like heat, drought and flooding will have a significantly negative impact on production in agriculture and forestry. The same goes for an increasing risk of outbreaks of fire, diseases and pests, according to the IPCC report. "The climate is changing faster than we used to think", says Jan Verhagen, senior researcher of Plant Research International in Wageningen. He advises plant breeders to take advantage of the report The status of the climate in 2007. "There is a lot of information available. It gives insight into possible locations for breeding trials."

'We see an increased instability through the seasons which affects quality, resistance and output. We are now mainly searching for stable-responding varieties in almost every geographical area', says Paul Degreef, responsible for worldwide breeding activities at Nunhems

secalis. As a result, we are re-routing our breeding strategy. The shift in disease patterns forces us to screen our grass varieties not only for rust, but also for other fungi-related diseases. We are searching for new test locations or are starting to develop new in-house testing methods, to be certain we can test our varieties properly."
According to Van der Heijden, the changes in microclimate at the plant level are mainly visible along in the North-South geographical axis and are less dramatic than those along the East-West axis. As an example of the latter, he mentions the increasing disease pressure on grasses and cereals in the United Kingdom, whilst in the past there were hardly any problems. "Fusarium in cereals was already a problem in Germany, but now it has also become a problem in England. The diseased reached England ten years later than Germany."
According to Pieter Egelmeers, resistance breeding is always a focal point. "Variations that occur in diseases can be partly caused by climate circumstances, by new strains or by changed circumstances. We have never focused on climate change. However, we have noticed changes and we adapt our varieties correspondingly, but we do not concern ourselves with the cause. Over the last ten years, the resistance to downy mildew in spinach has been broken more often than before. When that happens, we immediately start to breed in new resistance. The same goes for Pseudomonas in leeks, which also demands more attention at present. In sugar beets, Rhizomania, the Beet Necrotic Yellow Vein Virus, is travelling further to the North."

Production regions

"Apart from small changes at the micro plant level there are also shifts on a macro level. The production regions of certain crops appears to be shifting. This depends strongly on the variety. In cereals, there is hardly a difference. The wheat grown in France is the same as in Denmark", says Van der Heijden of Barenbrug. "The maize region is moving northwards, but that is mainly the result of selection on earliness. The changing climate, the fact that summers are on average one degree warmer, plays a minor role. The same goes for vineyards."
With regard to grasses, the shift in species is noticeable", says Van der Heijden. "Species move towards new regions, replacing others. Grass species first grown in southern Europe are now found in other areas. In tall fescue (Festuca arundinacea) we look specifically for varieties with good adaptability to many production regions. This could also be done by creating 'new' species like Festulolium, a cross between meadow fescue (Festuca pratensis) and perennial ryegrass (Lolium perenne) or tall fescue with perennial ryegrass. However, these are long-term processes with fairly unstable end results that are also hard to predict. This is why Barenbrug prefers to search for variation within the species to compile the right grass mixtures."

Economic forces

The shifts in production regions of vegetable crops has more to do with economic shifts than climate change. For labour-intensive crops, which are harvested manually, the cost of labour is the decisive factor. Land prices also play an important role. In recent years, for example, there has been a shift in greenhouse crops and field crops from Spain and southern France towards Tunisia and Morocco. Pieter Egelmeers of Rijk Zwaan mentions the French bean grown in greenhouses in the southern Spain. "These beans are mainly exported to England and require a lot of labour. With labour costs rising in Spain, the growing areas have moved to Morocco, where they also grow French beans for the UK market.
For our breeding programmes it is important that these shifts are noticed in time, because it takes 5 to 15 years before we can introduce a new variety on the market which is suitable for such a new production region. These kinds of changes keep us busier than the small changes in the climate pattern. A temperature rise of one degree during several decades has much less influence than the changing weather conditions during a single year." //

New generation priming for sugar beet seed

Yield improvements impress US farmers

Hajo Strik

Véronique Heyes, Germain's Business Director for sugar beet, smiles as she takes in our disbelief. "This is not just the next improvement, it is totally new", as she points to a picture of a sugar beet priming trial in the Red River Valley, USA and the marked differences in plant stands and vigour.

The benefits secured by priming seed are well known in agriculture and horticulture circles. These technologies form a key production tool which enables the producer, or the grower to better manage his cropping programme, so as to improve performance, and satisfy his customer's demand in volume, quality, and on time. The key benefits expected from primed seed are, in general, faster, more homogeneous and synchronous germination and seedling growth. These advantages will in turn provide a more advanced and uniform plant population and reduce the variability between plant growths and stand stages.

Better equipped

Primed seed is expected to be better equipped to deal with the vagaries of agro-climatic stresses, and take advantage of benefits conferred by better uniformity of growth. Earlier developments of a full leaf canopy enables earlier capture of solar radiation, improving growth and biomass production. Crop nutrition uptake and the performance of plant protection products can also be enhanced, when all plants are developing at similar rates, and benefit from equal chance of accumulating benefits provided by these treatments. A more uniform plant stand reduces the variability between plant sizes therefore giving benefits at harvest in terms of ease of harvesting, for example for root crops, or higher quality of uniformity in final merchantable yield, for example for leafy salads.
The term 'seed priming' now resides in the public domain as a generic way to describe a number of seed hydration and dry-back technologies. The principle being that initial germination processes are carried out on the seed in a controlled factory environment, and then dried back before radicle emergence. The seed when finally planted has gained 'advancement' in being ready to continue the germination process where it left it, several steps ahead of a seed, which was not primed. Priming processes do vary between crop species, and demand specific seed expertise in their methods and know-how. Responding to specific issues, such as to improve speed and vigour of inherently weak germinating or high inherent dormancy species; improving the germination performance of seed which has specific sensitivities to temperature or light requirements. Last, but not least, improving the uniformity and synchrony of germination over increased levels of stresses. All of these advantages must of course translate to bottom line benefits in terms of proven and reliable outright merchantable yield. No wonder that such technologies are closely guarded secrets, and at the end, what matters most to the end user is not 'how it's done', but 'what it does'.

Reliable know-how

Winning priming technologies are those which rely on delivering reliable process know-how, seed physiology expertise and a focussed customer interface for benefits sought, and delivered. Being able to prove added value is key in aiding every decision. And so it is no surprise that Germain's has a long track record of validating its priming technology benefits by engaging industry partners and centres of excellence such as universities and institutes to referee on this performance, and validate it with solid, independent data.
Agriculture and horticulture are not short term activities; data which can stand the test of time is certainly the norm, and seed priming certainly benefits from this. It has demonstrated time and again such benefits, such that the use of primed seed is now common place for many species, and experiencing steep growth in uptake for others. Germain's independence from seed parentage has always put it in a good place to be able to supply its expertise in an unbiased manner and openly to all partners. The company is a member of the Associated British Foods Plc group of businesses, and one of the leading companies in independent seed enhancement technologies.

Novel technology

So then, what about the new generation in sugar beet priming from Germain's? Not surprisingly, Germain's is understandably silent on the methods and principles engaged in this novel technology, which is in the process of being patented. And as reported earlier, it is the benefit, which it delivers, that is of key importance to existing and potential users. It is quite simply a leap forward in the acquisition of benefits normally expected from priming whilst it classically confers all the usual benefits that priming does: faster, more uniform germination and quicker final plant establishment. But it does it faster, and even more uniformly, than any existing sugar beet priming technology, including Germain's own long standing process, Advantage®, widely commercialised for over ten years from the USA to China. In independent trials carried out at the University of Minnesota, Crookston, over a period of 3 years and 7 seed varieties, XBEET delivers a staggering improvement in yield representing 4.7% additional recoverable sugar yield over Advantage, and over 11% additional yield over unprimed seed. So no surprise that this latest improvement is taking the sugar beet growing area of the Red River Valley by storm, where yield improvements in beet are a key profit driver, and enables more output from a smaller land area, thus freeing potential for other crops.

In Europe, the reform of the sugar regime has also made certain that 'Yield is most definitely King' to remain profitable in the face of steeply falling prices in beet and the steep rise in value for competing crops. Germain's has started its trialling programme in the EU in 2007, and will continue to be extensively tested in small and large scale independent trials this year. Encouragingly, the behaviour of XBEET in Europe closely mirrors the experience of the USA and a pre-commercial launch in the UK could be as early as 2009. //

The improved yield convinced the farmers of the Red River Valley

Plant breeding research in 2025

Charles Frink

Bernard de Geus is the Director of TTI Green Genetics. The ambitious aim of this institute is to strengthen the knowledge base of the Dutch plant propagation sector. De Geus recently presented his vision of plant breeding research in the year 2025 to the Netherlands Society for Plant Biotechnology and Tissue Culture (NVPW). Prophyta asked him to elaborate on his ideas.

Why did you choose 2025 as a year of reference for the future of plant breeding?
"If you want to have good plant breeding research in the Netherlands in the future, it is crucial to maintain the current strength of the plant breeding sector and the corresponding research. This sector has a world-wide focus and is very beneficial to the Dutch economy. The major reason for this is that much research is conducted in the Netherlands, both at companies and universities. Moreover, we still have reasonable access to well-educated personnel in the Netherlands, although the numbers of qualified human potential are decreasing. Why did I pick the year 2025? This is because it is very important that companies, universities and research institutions get together with the government to develop a long-term vision that is supported by commitment from all stakeholders."

What will be the state-of–the-art in plant breeding research in 2025?
"It is very difficult to predict the future of plant breeding research that far in the future. But there are certainly some trends today that are bound to continue. In the past 20 or 25 years, the potential offered by plant breeding and the plant sciences has increased enormously and continues to increase from day to day. Technology has been developed and continues to develop that will allow us to analyse an enormous number of data of various origin. We can actually do this now, and this will only increase in the future. Regarding plant breeding research in 2025, I would expect that the researchers themselves will actually be doing their work in an ICT environment, which we cannot envisage today. In areas like DNA sequencing, there has been an enormous development just in the past two or three years. Developments in this area will continue in the future and will result in genome sequencing in a snapshot. The '$1000 genome' is an issue today, but I believe that this price level will actually be reached in a few years. This will open up entirely new perspectives for the plant sciences and plant breeding.

What will be the biggest change?
"This leads to another important development, one that we are not well prepared for. You have to be able to analyse and to integrate all these data, they must be stored and the data have to be accessible. In short, we are challenged by enormous developments in what we call bio-informatics, data transport and data storage. This also means that we have to make solid international agreements, for example in areas such as validation and standardisation of methodology and data storage. After all, in a hundred years we want to be still able to use data that was generated previously. I expect to see tremendous developments in the near future, especially in the area of bioinformatics and data handling, including transport and storage. In the year 2025, I would therefore expect that a great deal of plant breeding research will be taking place in an ICT-like environment. I also expect that many more open source approaches will develop. These will be the biggest changes."

Will the entire industry change?
"I don't expect classical breeding to disappear. Many things will change in the years to come, but classical breeding will continue to exist. In 2025, breeders will still be making crosses, doing selection and using other classical techniques. But this will take place in an entirely different context."

How will the context change?
"Some of the most important elements are the changes in global food supply, growing plants under different conditions (with closed systems for example) and the fact that an increasing world population will lead to a decline in the amount of arable land, which means that production will become more intensive. These changes will not only result in new opportunities, but also threats."

Regarding the open source approach, are you referring primarily to open access to genomic data?
"I am referring to the increase in open source in the broadest sense. This concerns the availability of, and accessibility to, all kinds information. At a certain point, information will be available only from an open source. For example, major scientific journals are already demanding that all the data sets that are used in published research be made public. Thus researchers are already starting to use these open data sets, and this will only increase in the future."

Bernard de Geus: "I don't expect classical breeding to disappear"

Why is education so important to your vision of the future?
"I am referring here to education in the broadest sense. In the Netherlands, a large proportion of the professional population works in the agricultural and food sector. Due to globalisation, among other things, the businesses in this sector are changing, the production methods for many crops are becoming more technological. This results in a need – which will continue in the future – for well-educated and qualified people. This concerns people with qualifications from higher professional education (HBO) and university. With regard to university education, you can only provide good education at this level if you are also good in research. This is the basis for good education, and it is something that we should keep in mind. If the Netherlands is to remain successful in this sector – and I assume that we all want this because it generates a large percentage of our gross national product – we will have to continue to invest collectively in the sector, but at the same time keeping our eyes open and with a clear vision in mind."

In your NVPW presentation, you emphasised the creation of focus and critical mass. What does this involve specifically?
"This primarily concerns cooperation and collaboration between universities and research institutes. This creates the basis for education. Of course, you can work together as part of cooperative projects, but focus and critical mass are especially important for biology education the Netherlands in a general sense, and more specifically, for plant science education. This will be a foundation for the future. If you aim for a good position in the future, then your research has to generate added value. In the Netherlands we have 11 universities, 6 or more of which have biology faculties. At the same time, the Netherlands is a very small country. Consequently, we have to be more and more careful about how we use our available resources. I doubt very much that the education funding for the universities will increase. This means that we will have to work together to use the available resources as wisely as possible. This is why we not only need to develop focus and critical mass in the Netherlands, but we also need to keep an eye on developments taking place abroad. For example, high quality research is also taking place in Belgium and England, so you have to wonder if we have to duplicate research in the Netherlands. Perhaps we could consider supporting research at universities in other countries through structural cooperation and collaboration and sending our students there for specific courses." Long-term commitment to a shared vision is crucial. And this in turn requires the individual universities and research institutes to let go of their traditional 'me too' attitude. Research and development are becoming much more multidisciplinary in character. If you want to remain successful, you simply have to be able to see over your own disciplinary or institutional walls." //

Position of CIOPORA

In November 2002 the CIOPORA Green Paper on Plant Variety Protection has been published. Within Chapter 3.4 of the Green Paper CIOPORA expressed the view of breeders of asexually reproduced ornamental and fruit varieties on Essentially Derived Varieties (EDV) and Dependency. Today, an increasing number of cases and ongoing discussions in the industry regarding essential derivation make a comprehensive commentary of the EDV concept by the breeders necessary.

17 years ago the concept of Essentially Derived Varieties has been incorporated into the UPOV 1991 Act, after more than 40 years of great efforts by breeders, inter alia represented by CIOPORA. In order to strengthen the rights of the breeders and in particular to give to the breeders of original genotypes an additional source of remuneration and to provide an effective protection against plagiarism, a system of 'Plant Variety Right specific dependency', based on 'essential derivation', has been developed.
It is a common understanding among the UPOV members that it is up to the breeders to determine when there is essential derivation between varieties. Therefore, CIOPORA, as the international organisation representing breeders of asexually reproduced ornamental and fruit varieties, who hold ca. 70% of the Plant Breeders' Rights titles under the UPOV regime, determines in this paper the conditions under which an asexually reproduced ornamental or fruit variety should be considered as EDV of another variety. CIOPORA encourages all parties concerned to accept the determinations and thresholds given and to find on that basis amicable solutions in order to avoid costly court proceedings with an unpredictable outcome.

The basics

a) The concept of 'Essentially Derived Varieties' is a mixture of technical (describing) and legal aspects.
b) Whether a variety has to be considered to be an 'initial variety' or is 'essentially derived' from another variety is, in the first approach, a pure technical fact.
c) An essentially derived variety remains an EDV forever and an initial variety remains an initial variety, irrespective of the protection status. An initial variety itself cannot be an essentially derived variety and vice versa.
d) The legal aspect of 'essentially derived varieties' deals with the notion of 'dependency' of an essentially derived variety from an initial variety, i.e. with questions of the scope of rights and infringement.
e) Only if the initial variety enjoys protection, the title-holder of this variety can prevent everybody else from exploiting any essentially derived variety thereof, irrespective whether the essentially derived variety itself is protected or not. If the initial variety is not or not anymore protected, no case of dependency exists, and the owner of the initial variety cannot claim any control on essentially derived varieties thereof.

True extension

The EDV-concept as a true extension of the breeders' right and a temporary limitation of the breeders' exemption.

a) The title-holder of a protected variety can exclude all others from carrying out any of the acts mentioned in Article 14 (1) (a) of the UPOV 1991 Act, that is production or reproduction (multiplication), conditioning for the purpose of propagation, offering for sale, selling or other marketing, exporting, importing, stocking for any of these purposes of propagating material (and in some cases also harvested material) of his variety.

The UPOV 1991 Act has incorporated in Article 14 'Scope of the Breeder's Right' the subparagraph (5) 'Essentially derived and certain other varieties' with the aim to strengthen the breeders' rights. The right of the breeder to exclude others from the acts mentioned before no longer covers only the protected variety itself, but also varieties that are essentially derived from the protected variety. The EDV-concept, therefore, constitutes a true extension of the breeders´ right. It is applicable not only in the relationship between the title-holder of an initial variety and the breeder of an EDV thereof, but is applicable between the title holder and everybody who wishes to exploit the EDV.

b) On the other hand the EDV-concept also is linked to the so-called breeders' exemption. The breeders' exemption provides that the breeder's right shall not extend to acts done for the purpose of breeding other varieties and, unless such other varieties are essentially derived varieties, to the exploitation of such other varieties. Therefore, the EDV-concept does not constitute a limitation of the free access to germplasm, but it constitutes a temporary limitation of the exploitation of varieties, if they are EDV.

CIOPORA strongly supports the breeders' exemption within the temporary limits determined by the EDV-concept.

Aim

The EDV-concept is aiming at protecting Initial Varieties and the exclusive right of the title holder to exploit these Initial Varieties. In the sector of asexually reproduced ornamental and fruit varieties, the EDV-concept therefore is of particular importance for the following two groups of varieties: varieties which are solely based on the genome of the initial variety and where the genomic structure is highly conserved, e.g. spontaneous and induced mutants (1), GMO and apomicts (2), and varieties resulting from crossing and selecting, including the initial variety, being predominantly derived from the initial variety and being destined for circumventing the exclusive right to exploit the initial variety (plagiarism or me-too-varieties).

Interpretation of EDV-concept

Taking into account Article 14 (5) (b) of the UPOV 1991 Act CIOPORA is of the opinion that an asexually reproduced ornamental and fruit variety shall be deemed to be essentially derived from another variety (the initial variety) if it is clearly distinguishable from the initial variety, is predominantly derived from the initial variety or from a variety that is itself predominantly derived from the initial variety, and except for the differences which result from the act of derivation, conforms to the initial variety in the expression of the essential characteristics that result from the genotype or combination of genotypes of the initial variety. These three preconditions are of technical nature and shall be specified as follows:
sub a) The EDV has to be clearly distinguishable from the initial variety. This requirement draws the line between an EDV and a variety which is not clearly distinguishable from the protected variety in the meaning of Article 14 (5) (a) (ii). Whereas the EDV is a discrete variety, which is eligible for PVR protection, a variety not clearly distinguishable from the protected variety is not a discrete one but falls automatically within the scope of the protected variety. In this context, clearly distinguishable only is related to the phenotype of the respective varieties and not to their genotype. CIOPORA strongly supports this method to evaluate distinctness on the basis of a phenotypic comparison.
sub b) The EDV must be predominantly derived from the initial variety or from a variety that is itself predominantly derived from the initial variety. No general definition of 'predominantly derived' exists. However, some general statements can be made.
aa) A variety can only be considered to be predominantly derived from the initial variety, if material from the initial variety or from a variety, which itself is predominantly derived from the initial variety, has been used in the process of developing the EDV.
bb) Additionally, a variety can only be predominantly derived from one variety, as Article 14 (5) (b) (i) UPOV 1991 Act stipulates the EDV must be predominantly derived from the initial variety.
cc) Mutants, GMO and apomicts are not only predominantly, but totally derived from the initial variety. Such varieties are based solely on the genome of the initial variety and the genomic structure is highly conserved.
dd) In regard to me-too-varieties it is unclear, in what case a variety, which results from crossing and selecting, is predominantly derived from one of its parents. This question has to be answered on the basis of the genome of the varieties in dispute and it is up to the breeders of the specific species to determine a threshold, above which predominant derivation exists in these cases. As long as no such thresholds exist, the parties involved in a dispute have to find solutions on their own or, if they fail to do so, the courts have to decide on the basis of expert opinions.
sub c) Finally, the EDV must, except for the differences which result from the act of derivation, conform to the initial variety in the expression of the essential characteristics.
aa) The wording of the UPOV 1991 Act with

Breeding new varieties such as Rubens is a time-consuming and costly affair

The position paper of CIOPORA causes heated debates among breeders

regard to the requirement and level of phenotypic conformity between an initial variety and its EDV is unclear and contradictory. In Article 14 (5) (b) (i) a general conformity seems to be required, while Article 14 (5) (b) (iii) provides that the EDV must conform to the initial variety in the expression of the essential characteristics, except for the differences which result from the act of derivation. Contrary to that, in the PVR law of the European Community (Regulation 2100/94) and some other countries, this contradiction does not exist.

bb) This contradiction in the UPOV 1991 Act must not lead to a narrow interpretation of the EDV concept, as it would make the whole EDV concept meaningless for asexually reproduced ornamental and fruit varieties. This can be illustrated by taking the example of a colour-mutant: It clearly does not retain the essential characteristic 'colour' of the initial variety and thus, applying the narrow interpretation, could not be considered an EDV, although as a mutant it is the typical example of an EDV which has been one of the main reasons for the introduction of the EDV-concept.

cc) Therefore, a balanced interpretation of the EDV-concept must account also for the new tendencies in the development of new varieties, e.g. certain methods of developing new varieties, applying chemicals and other mutagens, which allow the development of plants which phenotypically differ significantly from the mother plant without altering the genome and its structure significantly. Thus, the balanced interpretation does not per se limit the number of phenotypic differences between the initial variety and an EDV thereof.

dd) As far as asexually reproduced ornamental and fruit varieties are concerned, in general all phenotypic differences between mutants, GMO and apomicts on the one hand and their mother variety on the other hand result from the act of derivation. As a consequence, there exists no limit to the number of phenotypic differences between an initial variety and this type of EDV, because all the differences result from the act of derivation.

ee) In regard to me-too-varieties, a variety which has been created by crossing and selecting, can only be considered to be an EDV if it – in addition to the two requirements mentioned under a) and b) above - retains all essential characteristics of the initial variety and only shows changes in insignificant characteristics.
In this regard, conformity to the essential characteristics shall be measured on the basis of the phenotype. However, out of the list of the botanical characteristics listed in the UPOV-guideline for a species, only such characteristics shall be taken into consideration which are essential for the exploitation of the variety (in contrast to the measurement of the DUS examination, in which all botanical characteristics out of the UPOV-guideline are taken into account, without making a differentiation between essential and non-essential characteristics). As up to now no clear differentiation between essential and non-essential characteristics of asexually reproduced ornamental and fruit species exists, this may be decided on a crop-by-crop basis by the respective breeders. As long as no such differentiation exists, the parties involved in a dispute have to find solutions on their own or, if they fail to do so, the courts have to decide on the basis of expert opinions.

Conclusion

As a consequence from the explanations before it can be concluded that in the area of asexually reproduced ornamental and fruit varieties all mutants, GMO and apomicts as well as me-too-varieties have to be considered as EDV.

The proof

The major challenge of breeders of asexually reproduced ornamental and fruit varieties is to find a practicable solution to prove that a variety is an EDV from another variety. Usually it is the responsibility of the plaintiff to submit to the court and prove all facts which he bases the claim on. In EDV cases this is particularly difficult with regard to the question whether the supposed EDV is 'predominantly derived' from the initial variety. CIOPORA submits for the two groups of EDV in the area of asexually reproduced ornamental and fruit varieties the following solution.

Mutants, GMO and apomicts

In an EDV dispute concerning a mutant, a GMO or

Important News

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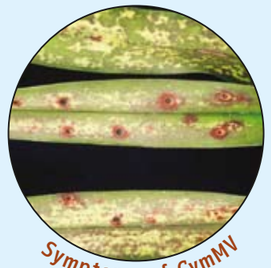
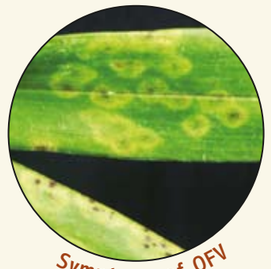


Symptoms of CymMV



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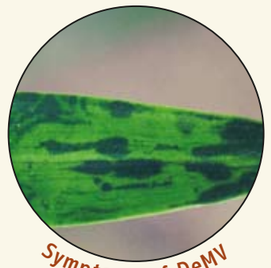

Symptoms of DeMV

Japanese publication of Prof. Dr. Narinobu Inouye (Japan) on orchid virus diseases translated into English language now.

Prof. Dr. Narinobu Inouye, Japan is worldwide known as an expert on orchid virus diseases and he has been studying this topic for about 40 years. He has collected a unique database of pictures, most of them his own photographs, and has described elaborately all aspects of virus diseases. How to detect the very first symptoms, spread and how to prevent and control; it is all being described and with a keen eye for details.

Great value

The Dutch Inspection Service for Horticulture (Naktuinbouw) has recognised the great value of this publication and has taken the initiative to publish this rare book for the first time outside Japan.
The book contains over 260 pictures, never published before and will have a full index on almost every orchid virus-related disease.
And, most important, now the vision and background information of Prof. Dr. Narinobu Inouye can be read by researchers all over the world in English.
The final date of the publication of this book is due within a few months.

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The book Viruses of Orchids

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Comments

A remarkable perspective

It is interesting to note that the discussion about the interpretation of the essentially derived variety (EDV) provision in the UPOV 1991 Convention still flourishes. ISF published its vision on this subject in its paper 'View on Intellectual Property' in 2002. The recent Ciopora position paper shows a few remarkable perspectives, which invite to further contemplation.

The text of UPOV 1991 is not in line with the Ciopora statement that 'an initial variety cannot be an essentially derived variety'. According to the UPOV text 'where the protected variety is not itself an essentially derived variety' the protected initial variety (INV) can certainly be itself an EDV in which case its protection does not extend to EDV's from that INV. This is an important legal principle with the consequence that low genetic conformity thresholds (e.g. < 80% for seed crops and < 95% for selfed or vegetatively propagated crops) may lead to the situation that most varieties are EDV from another variety so that there will be no dependency.
The Ciopora interpretation of the UPOV 1991 text that in case of mutants, apomicts and GMO's the number of phenotypic differences between the INV and the derived EDV is not limited because these differences are the result of the act of derivation, is contradictory to the intention of this provision as shown in the minutes of the 1991 Diplomatic Conference and the UPOV paper IOM/IV/2 paragraph 6(ii) in which it is clearly stated: 'The derived variety must retain almost the totality of the genome of the mother variety and be distinguishable from that variety by a very limited number of characteristics (typically by one).' The text of the Convention mentions: EDV's *may be obtained* by selection of a mutant/variant, genetic engineering or backcrossing. So not every type of mutation, e.g. by chromosome doubling, will lead to an EDV. That is only the case if the variety resulting from this method conforms to the INV in all essential characteristics except one or two that differ because of the act of derivation.
The introduction of me-too-varieties in the Ciopora position paper is interesting. These varieties are meant to be the result of cross breeding and selection. The same UPOV paper IOM/IV/2 states in paragraph 6(iii): 'The derived variety must have been obtained using a plant improvement method whose objective is the achievement of the requirement of paragraph (ii) (mutation, gene transfer, full backcrossing scheme, etc.); in other words, no varieties bred according to a classical or other scheme of crossing in which selection in the progeny is a major element would become the subject of dependence.'
So only varieties bred by a full backcrossing scheme *and* meeting the strict conformity requirement may be regarded as EDV.
Finally the general threshold of 90% genetic conformity is too strict for mutants, where apparently the point mutation, with a genetic difference close to zero, was taken as the EDV archetype by the drafters of the 1991 UPOV Convention. But as remarked before, such a threshold enhances the chance that many of the initial varieties may after all be EDV's themselves.

Huib Ghijsen
This comment is made on personal title

an apomict it is very difficult, if not impossible for the plaintiff to prove that the supposed EDV belongs to this group of varieties, as he usually is not able to gain access to internal information of the defendant. On the other side it is rather easy for the defendant to prove that his variety does not belong to this group of varieties but results from crossing and selection. Therefore, there should be a shift of burden of proof if the plaintiff submits facts that reasonably indicate that the supposed EDV is a mutant, a GMO or an apomict.
a) CIOPORA is of the opinion that such facts that indicate the existence of mutants, GMO and apomicts in general shall be based on a comparison of the genome of the two varieties in dispute. If the plaintiff on the basis of a reliable DNA-analysis submits to the court and proves a Jaccard Similarity Coefficient between 0.90 and 1.00 between his initial variety and the supposed EDV, he has furnished a prima facie proof that the supposed EDV belongs to the group of varieties mentioned before. In this case, the defendant has to prove that his variety is no mutant, GMO or apomict from the initial variety or from a variety that is essentially derived from the initial variety.
b) However, this threshold does not mean that varieties, which range within the threshold, are automatically EDV. If a variety retains e.g. 93% of the genome of another variety, but has been created by way of crossing and selection, it obviously does

Comments

An unacceptable burden

Plantum NL believes more clarity on Essential Derived Varieties could help breeders to enforce their rights. However, the Dutch ornamental breeders united in Plantum NL have studied the position paper of Ciopora on EDV and do not agree with the position of Ciopora on several points.

Plantum NL considers that the existing threshold of 0.90 for all vegetatively multiplied species is an unrealistic approach. A threshold has to be decided on a species by species basis because there are big differences between the genetic distances within the different crops. It is very unrealistic that a crop specific threshold for all species should be decided for the coming years. In case of a conflict, the holder of an initial variety should always have to prove that the genetic similarity between his variety and the supposed EDV is significantly higher than the genetic similarity between his variety and a representative set of varieties of the given species. The argument that the threshold of 0.90 is only used for the shift of the burden of proof does not alter the fact that the genetic conformity plays an essential role in the assessment of whether or not a variety is an EDV. Once the burden of proof has been moved, the breeder of the supposed EDV would have to prove that either his variety is not a mutant, GMO or apomict or that the initial variety has not been used. This will often be very difficult and thus places an unacceptable burden on that breeder.

Plantum NL also does not agree with the concept of me-too-varieties, since it is in contradiction with the breeders exemption. Breeders should not be restricted in the use of one another's variety in their normal crossing and selection out of fear for an EDV claim.

Plantum NL represents the majority of ornamental breeders in Europe and accounts for about 40% of the applications for Community Plant Variety Rights. It is therefore one of the most concerned parties if it comes to plant variety protection.

Aad van Elsen
Managing director Plantum NL

not belong to the group of mutants, GMO and apomicts. The threshold in this group only serves for the purpose of shifting the burden of proof, not for establishing whether a variety is an EDV or not.

c) On the other hand the threshold also does not mean that varieties, which are below it, are excluded from being an EDV. If e.g. a mutant retains only 88% of the genome of the initial variety, it has nevertheless to be considered to be an EDV. However, there is no shift of burden of proof, so that the plaintiff would have to fully prove that the supposed EDV is a mutant of his initial variety.

d) The threshold of 0.90 has been chosen by CIOPORA because it turns out in the field of asexually reproduced ornamental and fruit varieties that this value is a good general separator between mutants, GMO and apomicts on the one hand and varieties, which result from crossing and selection on the other hand. However, if it turns out that the threshold does not fit to a given species, it is up to the breeders of this species to agree on a different threshold. As long as no such crop-specific thresholds exist, CIOPORA strongly submits to use the general threshold of 0.90 for the shift of burden of proof in EDV cases concerning mutants, GMO and apomicts.

e) If the defendant uses his breeding records in order to prove that his variety is not a mutant, GMO or apomict of the initial variety one should evaluate this evidence critically. More valuable evidence might include material which the defendant presents from the varieties he claims to be the parents of the supposed EDV. In this case it can be explored by way of a DNA analysis whether these varieties could be the parents of the new variety or not.

Me-too-varieties

In an EDV dispute concerning a me-too-variety it is very difficult, if not impossible for the plaintiff to prove that material from his initial variety has been used in the process of developing the supposed EDV. Therefore, ciopora suggests: if the plaintiff submits and proves to the court a genetic conformity higher than the threshold above which predominant derivation exists[1] and a strong phenotypic conformity between his protected initial variety and the supposed EDV[2] the defendant has to prove that he has not made use of the initial variety or a variety that is essentially derived from the initial variety. //

1. Mutants appear as variant individuals of the initial variety and can be selected as somaclonal variants after in vitro culture, variant individuals in clonal propagations of the initial variety and other procedures.
2. Apomixis describes the asexual reproduction of plants through seed formation without fertilization, i.e. without the fusion of a male and a female gamete. The male gamete, if integrated at all, serves only to stimulate the division of a gametophytic, maternal cell to form a zygote, an embryo and a seed.

Generation gap will alter operational management

Hajo Strik

Who will be the grower who in 2022 has to decide which crops to grow and which varieties to choose. An innovator, who will look for niche products outside his own discipline? Will he be an entrepreneur who together with a multinational food producer, a health insurance company and a dairy farmer develops a new breakfast drink which prevents osteoporosis? Will he work together with fashion designers and a culinary chef? Or will he act more or less the same as his father before him?

There is still a long way between fiction and reality but producing food for special needs is one of choices future growers may have

The Rabobank is the most important financial partner for Dutch entrepreneurs in agriculture and horticulture and is thus highly involved in future plans in this sector Director Dick Oosthoek, director of the horticultural department, wondered how the next generation of growers would develop strategy and product innovation. The idea of using a fictional example grew in his mind and soon the 'World of Jip' was born. Jip, a typical Dutch boy's name, is at present a young entrepreneur, not ready yet to be the successor of his father, having new and revolutionary ideas. A story of four generations of growers each facing their own problems and challenges within their own specific timeframe, thus presenting the future in a more realistic way.

A family tree

In 2007 the 'World of Jip' was published as a book, but it wasn't a stand-alone item. In addition, workshops and regional meetings were organised for interested growers, confronting them with questions about past, present and future methods of managing their own facilities. The great-grandfather of Jip, called Cor (short for Cornelis) founded his company in 1952, being 40 years old and looking for effective ways of producing in his own region. In a wooden glasshouse of 2000 m2 he starts producing tomatoes, beans and cauliflower. The whole family participates, he transports his products via the Dutch canals to the auction centre, where the price is dictated by the auction clock. His son Kees, the grandfather of Jip, learns the basics at the horticultural school and helps his father. Midst 1960 he succeeds his father in the business and expands his area to 15.000 m2. He specialises and focuses on tomatoes, the other crops are being disposed of. Like many colleagues, his main goal is increasing production to the maximum level. Quality or taste are not an issue, he and the other growers discuss topics as m2/area, growth, production and weight. Managing the economic side or long term investments are not his main business, he prefers to be active in the greenhouse with his products. More and more labour is needed and

What kind of person will Jip become? A master craftsman, a specialist growing niche products, a chain manager, covering the whole track from growing to supermarket, or the pluralist who focuses on trends in society. In 2022 we will know

temporary labour is hired from abroad, where cheap labour costs is found in countries like Turkey. However changes are iminent as his son Jan-Willem is taking on his MB study of economics at Wageningen University. Influenced by a traineeship in the United States he aims for top quality tomatoes and minimal 5 hectares of greenhouse. The long working hours of his parents, who work seventy hours per week or more, is in his view an old fashioned and unwanted situation. The auction as unique market access is in his eyes outdated and direct sales to big retail chains are his goal. He realises that a professional organisation is needed in order to meet the demands of these customers, adopting high quality standards of producing vegetables. He decides to quit his membership of the auction, thus ending a family tradition, and is very successful in introducing his own brand in a special product presentation at the supermarket. Jip, his son, is at first not sure whether he wants to succeed his father. First he likes to see the world and backpacks away. His grandfather Kees supports him, wanting him to do the travelling he himself never could realise due to the many obligations of the family business. Working in many jobs to earn money while travelling, he discovers his roots and is ready to take over the family business in 2013. But he wants to on his conditions. People management in combination with creativity and product experience are the base of a successful business according to him. Much more than efficacy and tight structures and rigid business models.

So the future starts

A new way of looking at things is the focal point. Jip develops new meals together with a top chef and does research for special foods in nutraceuticals, like special juices for stoma patients and diabetics. Not the maximum production per m2 but the maximum in taste and presentation forms are his goal. The human senses like smell and visual attraction are central in his opinion. Of course, one can elaborate further, but this is not a novel or fiction story. One could say it may be science fiction in the literal sense of the word. It only means looking from another perspective, breaking away from traditional ways of thinking. In marketing terms it is called out-of-the-box and that is exactly what new entrepreneurs should do to secure the future in their business.

Back to reality

The participants of the workshop are enthusiastic but also slightly reluctant. "I like to day-dream but this is going one step too far.Business as it is, is already consuming too much time." Some critics find this way of thinking about the future too soft, because a grower always has to aim for a profit and he should be pragmatic in decisions. Overall is it recognised, that aiming for a good balance between family and business is a perfect target, but there is still a long way between fiction and reality. Dick Oosthoek is positive about these thought-provoking reactions. "If one does not exaggerate, one does not start a dialogue", he claims. As a bank manager, of course he likes a healthy cash-flow, but on the other hand having an open mind for other topics helps to broaden his vision and prevents a tunnel-vision on product or business. Internationally growers are on-the-move and not every country has the same speed or momentum and thinking and adapting to market changes. Seed producers have a long term commitment, whilst growers and producers always have the short term sales goal. This is the natural conflict between marketing and sales, between breeders and salesmen, between research and market demands, but still merging each others vision for the future that hopefully will lead to a creative cease-fire. An integrated market approach, caring for cultural differences and respecting helicopter views from other angles is necessary to live in the near future in this World of Jip or the World of any other young entrepreneur in the world. //

Seed companies do not profit from soaring food prices

Hajo Strik

'A perfect convergence of conditions' is what analysts point to as the cause for rising food prices. Fast growing demand from countries like China and India is one factor, but catastrophic harvests in Africa and South-eastern India also play a role. Add to that the effect of trends such as the demand for bio-fuels and high petrochemical oil prices and you have a recipe for disastrous food shortages for third world consumers. Farmers are enjoying high prices for their crops, but so far, the profit margins for seed companies fall short of expectations.

Between January 2007 and January 2008, the FAO food price index increased by 47%. Prices for cereals and vegetable oils were especially high, peaking at 62% and 85%, respectively. Average prices for other food commodities, such as maize and sugar, are also skyrocketing. A recent report from the FAO shows that prices have increased by 30-40% for these essential food products.

Structural shortage

The structural shortage of food is no longer something that will take place in the distant future. Although we have not yet experienced large-scale unrest or nation-wide protests, this is not an unrealistic perspective. Reality is starting to close in. For example, in the Philippines the National Food Authority has deployed 'rice marshals' to catch unscrupulous traders who reportedly hoard government-subsidized rice. In Cote d'Ivoire crowds were caught looting warehouses in a harbour because corrupt civil servants were keeping them away from the food, which was donated by the UN. In Haiti protesters were killed while demonstrating against high food prices. Indian protesters burned food rations stores in West Bengal as the owners were selling subsidised food on the black market. Food aid is also becoming an economic issue as the falling exchange rate of the US dollar, compared to currencies such as the euro, means that people can buy 50% less food per dollar than they could a decade ago.

No higher margins

Because the demand for seeds is so high, seed companies are increasingly confronted with seed producers who refuse to deliver for the original contract prices. "The seed companies are forced to pay more than they planned. In this situation, the seed companies have hardly any choice, because their customers cannot wait for legal battles to be fought. Their crops simply have to be sown on time", says Paul Joordens of Joordens Seeds. "There have been informal price increases of between 30% and 40% for grass or mustard seed from the Czech Republic and rape seed from Hungary. And these are no exceptions; this production phenomenon is happening worldwide. This means that seed

companies have to readjust their purchase costs, which means losing profit, but they are rarely able to pass these extra costs on to their customers." Because the seed companies are being badgered from two sides, their profits inevitably decline. Their total liquid assets may not be falling, but there is certainly a drop in percentages. "This will force seed companies to charge the current market price and agree in contracts only to deliver the seed itself; the price can no longer be guaranteed beforehand. This danger is also looming over future deals for seed production." In contrast, farmers are profiting from this sharp price increase, which appears to be structural, not incidental. "It will undoubtedly lead to discussions about whether they should continue be subsidised by national or European farmers' organisations, or at least to what extent. A shift can already be seen in this regard. Regional development is increasingly being promoted, and the individual farmer is seen as part of this type of economic support."

New production areas

Both the European Bank for Reconstruction and Development (EBRD) as the FAO believe that new food production areas might be a solution. There is significant untapped agricultural production potential in the regions of Eastern Europe and the Commonwealth of Independent States (CIS), especially in countries such as Kazakhstan, Russia and Ukraine. In these countries, around 23 million hectares of arable land were withdrawn from production in recent years. At least 13 million hectares could be returned to production at little environmental cost. In a speech delivered by Charles Riemenschneider, Director of the FAO Investment Centre, FAO Director-General Jacques Diouf called for courageous steps to be taken now to help unlock the untapped agricultural production potential, noting that current predictions for CIS cereal production will increase with 7%, to 159 million tonnes, between 2007 and 2016. But there are more options, such as improving agricultural knowledge. "It is a serious waste to send valuable seed to a country where they do not use the seed correctly. It is not always the fault of those countries, but merely the lack of knowledge and technology. Spreading cereal seeds randomly on a field, like sowing grass seed for lawn, is asking for yield failure. The same goes for other crops", says Mr. Joordens. There are also economic benefits. "If a farmer can realise a good harvest with 20 kilos of seed that are neatly sown instead of 100 kilos thrown into the wind, this means an 80% reduction in seed costs." According to FAO field workers, these figures are not unrealistic. This means that seed aid for developing countries can be optimised and can become much more effective. This is also an important issue for seed companies and for their role in social enterprise, a responsibility that can no longer be ignored.

The agricultural production potential should be untapped to provide enough food

Biofuels

The current discussion is also leading to growing concern about products like biofuel. Should valuable farmland be used to produce an energy source that has no more than 35-40% efficiency when used in a diesel engine? Are commodities like maize or sugar more important as energy sources or as food ingredients? This is not entirely a hypothetical question if we limit the problem to cereals, the most essential products for humans. The fact that biodiesel reduces the use of fossil energy sources is a form of window dressing to achieve short-term impact in order to avoid the real issue. Of course, the three-letter prefix 'bio' adds an almost magic environmental sound to every word, but in fact it is purely a semantic issue. Biodiesel is a product which has forced two totally different sectors into a marriage of necessity. From an image perspective, it is the oil industry that gains the most from this deal, adding a 'green' image to a product that is a known polluter. The agricultural industry positions itself as an environmental saviour with a 'green' product. But the question is whether this is really helping the environment?

Balancing

The main issue is as old as the principles of the market itself. A lack of supply and a growing demand lead to increasing prices. Shortly after World War I, Keynes presented his theory about anti-cyclic governmental behaviour, using taxes and subsidies to steer the economy. Investment was determined by the relationship between expected rates of return on investment and the rate of interest. But can these tools be used to control the present exorbitant rise in food prices? This will remain a theoretical question, because this would require a global authority to take responsibility. Let us return to the comparison with oil, the other main requirement for mankind besides food. The oil industry is organized within OPEC, which first flexed its muscles in Vienna in the 1970s and 80s by stopping or reducing oil production, thereby raising oil prices by five dollars per barrel without warning. Nowadays, OPEC is still recognised as the primary global market organisation in the oil sector, but it plays a more moderate role. Nevertheless it is still very influential. So who is going provide the international leadership for safeguarding our world food heritage? //

Global warming influences seed storage

Hajo Strik

Everyone knows that global warming will have an influence on a great many aspects of life. But that even seed storage will be affected needs some explaining. "It is a simple question of physics", says Jan Appelman, general manager of Agratechniek. "Warm air contains more water than cold air."

"With the rising average outside temperatures, the average percentage of air humidity rises also", explains Jan Appelman. "Higher (absolute) humidity will cause more problems for the drying of products. Consequently it will become more and more important to dry the air itself. Often air with a too high humidity is used." This unexpected aspect of global warming should be dealt with by seed companies as in future they will need a new seed drying strategy. People are mainly focused on the relative humidity (RH). As a consequence often too moist air is used unknowingly. Air of 35°C and 30% RH contains almost twice as much moisture than air of 5°C and 100% RH. If air of 5°C and 100% RH is heated up to 35°C, the relative moisture lowers to 15%. It is therefore easier to dry with (heated) cold air as it will absorb more moisture. However, some seed varieties are sensitive to warm air. The maximum drying temperature for these varieties is about 20°C. Agratechniek has developed special drying equipment to dry with such low temperatures.

Showing the processes

Depending on geographical based weather conditions, different systems of seed drying have been developed all over the world, but based upon a unique mini-climate zone in the north-western part of the Netherlands, that area became the focal point. Due to that climate zone, mild in winter time and moderately warm in summer, it automatically became the choice for well-known seed companies to develop test sites. And where seed companies are, seed treatment companies also flourish.
One picture says more than a thousand words and as seed drying techniques are complicated, Agratechniek has made an animated movie to explain the details of the process. In a simple but very clear manner the animation shows step by step the different processes, see www.agratechniek.com and tab animations.
The newly appointed sales advisor Bert Dijkman and Jan Appelman are enthusiastic about this logical solution, because they received an overall positive reaction. Bert Dijkman: "I have been employed with one of the world's leading seed companies for over twenty years and I have built up a lot of experience in seed treatment techniques. For the last few years I focussed on the innovation and computerisation of the seed treatment techniques. For many years before that, I was involved in choosing the right equipment from many suppliers, so I know how important it is, that clients can recognise in a few pictures the way your company is performing."

In an individual box drying system the desired drying can be programmed for each individual box

Moisture in the air in grams per kilo of air

°C	%RH	M g/kg
35	30	10.53
25	50	9.87
10	90	6.85
5	100	5.40

Moisture equilibrium

Many seed companies invest a great deal in climate control and cooling equipment for the storage of their valuable seed, aiming for the necessary guaranteed quality. However, in the last phase of the product chain seeds are often treated or packed with a high atmospheric humidity, due to the non-treatment of the used air and the used method. Traditionally open pallet boxes will be piled up and a central blower forces warmed air through the pallets, individually. In practice the boxes will remain piled up during the working day. The operator waits until the whole pile is dry before removing all the pallet boxes. This means that the first boxes are exposed much longer than needed. For some seed varieties this could cause damage, as the shelf life is shortened.
Jan Appelman: "It would be ideal for each individual box to be dried according to its specific humidity percentage and that the used airflow be adjusted just in time so the seeds do not damage by rubbing against each other. Agratechniek developed the automatic seed drying process, using the moisture equilibrium of the seed related to the humidity percentage of the (stationary) air around the seeds. One can achieve the required moisture equilibrium by programming the relative humidity and temperature (or absolute moisture) of air coming out of the seed that corresponds with the moisture equilibrium moisture from the specific seed variety. The dryer will automatically stop when the required settings are matched."

An absorption dryer reclaims energy by reusing warm and moist air to preheat incoming air flow

Fully automatically dried

The whole process can be carried out automatically, which has already been proven on sites in France and America. Central in the system is the Agra-Dry-Control (ADC), a processor with an LCD touch screen, which can be applied to multiple controllers of drying processes and the conditioning of air. To program the desired moisture value of the seed, one needs to enter the wanted relative humidity of the air, fitting with the desired moisture value of the seed. A chart with the exact parameters is available. For the control, the temperature and relative humidity is measured from the incoming and outgoing air. The absolute moisture value is calculated. The flow is measured by a flow-sensor or flow-fan. The desired flow can be configured (amount of product) and regulated automatically (placing of an extra box). With an air mixing unit, it is possible to use the optimal air condition (inside or out). In principle, every dry(drying) process can be controlled this way, even existing installations. Every ADC can control one or more sections/installations. For every type of installation the ADC is provided with a specific programme.

Individual box dryers

The individual box dryer can contain up to 10 boxes of 400 litres wet seed each. With this dryer the seed in every box is dried individually. Using this method the seed boxes can be placed in and removed from the dryer independently. The drying can therefore start as soon as one box is filled with seed. The desired drying can be programmed for each individual box. The drying of a box will stop at the moment the desired moisture content of seed in that box is reached. The drying process is characterised by the gradual heating of the product. The desired moisture value of the seed is programmed. The temperature and the relative humidity of air coming out of the seed are measured on top of each box individually. With the individual box dryers for fluid drying, the boxes are placed separately in a construction(suggest configuration) against an air distribution system. Every air outlet is provided with a centrifugal fan. When the box with seed is placed into the dryer, the fan will automatically increase airflow till the seed is fluid; When the seeds starts to dry, the airflow will reduce and drying continue to prevent damage of the seed and pellets. When the desired moisture of the seed (out coming air) is reached, the airflow will slowly reduce because the moisture of the seed stays stable. When the airflow has reached a minimum, the product is dry and the boxes can be removed. //

New hygiene system increases security factor

John van Ruiten

In the course of 2008 Naktuinbouw expects that a preventive hygienic system for vegetable seeds and plants will be introduced. The first vegetable crop covered by the system will be the tomato, as this new system is urgently required for this particular crop. Other crops are scheduled to follow soon.

In co-operation with Plantum NL, the French organisations FNPSP and SF3P and Dutch/French vegetable seed producers and plant growers, Naktuinbouw is busy developing a 'hygiene system'. The development of such a system is designed to help the sector increase the security factor surrounding the production of seeds and plants free from diseases.

Calamities

In recent years, there have been a few serious incidents with highly contagious diseases occurring, when vegetable plants were being raised or vegetable crops grown. In some cases these appear to have been caused by the presence of infection in the seeds. In other cases however, the source of the infection could not be found. Each incidence involved infections that had slipped though the net, despite all the tests conducted in the laboratories by the production companies themselves and by inspection agencies. This can occur if the disease concerned, such as bacteria Clavibacter, Xanthomonas or a virus or viroid, is present in an extremely low percentage, ie.less than 0.01%, or if the available testing methods are unable to guarantee full detection.

Clean seeds

If the disease in question has the opportunity to further develop at the plant nursery or directly from the grower, then just one infected plant can have disastrous consequences for the entire company. One way of limiting the risks is by improving the testing methods and by testing higher numbers of seeds. This course of action is now being followed by international authorities. Another, more preventive method, is to ensure that the risk of any infection developing during the seed production phase is kept to an absolute minimum and if at all possible reduced to almost zero for certain diseases.

Clean plants

Along with the introduction in the seed sector, the development of the hygiene system will continue on vegetable plant nurseries. These companies have also made every effort in the past few years to minimise the risk of outbreaks and, above all, further spread of these infectious diseases during the process of raising plants. Also changes in production like

grafting and topping requires a further examination and development of the hygienic measurements.

Requirements

The system currently under development with the working title 'Clean Seeds' and 'Clean Plants', contains the requirements to which seed and plant production would have to comply to create more certainty that the disease concerned, cannot occur. Contributing factors include; production in an environment free of the disease concerned, use of guaranteed 'disease free' basic seed, high level company hygiene on all fronts, permanent assessment/monitoring of crops and crop sampling and testing.

International certification

Due to the urgency of the situation, a start will be made with tomatoes. It is expected that the system will be launched in 2008. The accreditation system will be open to vegetable seed producers and young plant producers internationally. Naktuinbouw expects to use periodic audits of the participating companies by specialists in the fields of crops, diseases and company hygiene to systematically assess the international production sites. Subsequently, the operational scope of the system can be extended to cover other crops. //

Intellectual property protection challenges public research

Niels Louwaars, Bram De Jonge and Wietse Vroom

Patents increasingly reduce the freedom to operate in plant breeding. Biotechnology companies are known to actively seek patent protection for their products, but also knowledge created by public universities and research institutes is often protected. This is legitimised by policies of these organizations themselves, their public funders, or the contracts underlying public-private partnerships in research.

Niels Louwaars, Bram De Jonge and Wietse Vroom are researchers at Wageningen University, the Netherlands

The trend to protect knowledge creates particular challenges for universities that want to contribute to reaching the Millennium Development Goals, such as Wageningen UR in the Netherlands. This was the reason for this university to collaborate with the Netherlands Centre for Society and Genomics to organise an international conference on April 10 this year, to discuss the main tensions in the current intellectual property (IP) landscape, and possible ways to address the increasingly restricted access to publicly developed technologies for use in research for development.

Breeding for development

The face of plant breeding research has changed significantly. This is not only due to the rapid technological developments in the field of genomics, but also to revolutionary changes in the legal and policy environment in which plant scientists and breeders are working. Biotechnology introduced the patent system into breeding research. Moreover, international agreements on biodiversity increased the importance of contractual arrangements to access genetic resources. Patents provide a temporary exclusive right to the inventor of useful technologies in those countries where the patent is accepted. Whilst this is intended to stimulate innovation, it may also reduce access to technologies and increase transaction costs. The extension of the patent system into the field of plant breeding started in the 1980s in the USA and has extended to others countries since. The TRIPS agreement of the World Trade Organization and more recently bilateral trade agreements extend such rights to developing countries. Even though there is a broad consensus within the seed sector that intellectual property rights have a role to play in research for commercial markets, these legal systems also influence research for non-commercial use, i.e. 'basic research', research for non-commercial crops and research with the aim to reduce poverty and hunger. Several examples have been documented in the struggle to obtain all the licenses that are necessary for introducing technologies into developing countries. The dozens of patents resting on the nutritionally enhanced 'Golden Rice' is a well known example. Developed at universities in Switzerland and Germany it required a major commercial company (Syngenta) to disentangle the thicket of rights and negotiate licenses for all these patents in their use for the poor. Even though many more examples exist, most are not documented simply because no agreement was reached, or more commonly because negotiations failed to start because the patent holders did not show any interest to negotiate at all.
It is not only the usual suspects, 'the multinationals' that create such limitations to research for development. Universities also have patents and are not always eager to part with their rights for development oriented research. An example is the XA21 gene in rice which codes for an important disease resistance and patented by the University of California, Davis, based on earlier research by the International Rice Research Institute and its partners in India and Mali. Only after lengthy negotiations and public arousal, did UC-Davis release the patent for development purposes and even developed a benefit sharing mechanism for profits derived from the commercial use of the patent.

The conference

"I would also urge Dutch universities and research institutes to adopt institutional IP policies that take account not only of valorisation of knowledge and incentives for researchers, but also the importance of access to knowledge and freedom to operate for development purposes", said the Dutch Minister for Development Cooperation Bert Koenders during his closing speech at the 'Knowledge on the Move' Conference, held in The Hague. Responding to this statement a conference was recently organised at Wageningen University and Research Centre (Wageningen UR), aptly titled: 'Reconsidering intellectual property policies in public research - sharing the benefits of biotechnology with developing countries'. The meeting brought together participants from fields as distant as plant sciences, development studies and practice, research management and intellectual property practice, private sector seed industry, and civil society.
The day discussed the role of public research organisations in supporting agricultural research for development in the light of the emerging restrictions to the freedom to operate. Wageningen UR plays an important role in genomics research in public-private partnerships, notably on potatoes and tomatoes. Contributing to the Millennium Development Goals is one of the priorities in its strategic plan. Wageningen UR was treated as a case study of the more generic questions arising at all public research organisations worldwide.
The conference included presentations on changing trends of intellectual property (IP) management at Wageningen UR, the perspective of public funding organisations on the valorisation of research outputs, the limited freedom to operate as experienced by representatives of research for development, current practices of IP management in public-private partnerships, and potential strategies to increase the freedom to operate for 'research and development'. The day also included a panel discussion with representatives from the Dutch potato breeding industry, 'research for development', civil society, and Wageningen UR management.

Developing countries

Plant breeding in developing countries is largely a public service for the emerging local seed enterprises and to support development programmes that reach near-subsistence farmers that are not likely to become customers of the private seed sector. The public sector also plays an important role in breeding crops that do not attract private investments, such as pulses and small grains.
For the most important food crops, these national breeding programmes lean on international research by the centres of the Consultative Group on International Agricultural Research (CGIAR). These programmes have been at the basis of the Green Revolution which significantly contributed to regional (notably in Asia and parts of Latin America) and global food security through coordinated breeding efforts, the sharing of scientific data, the free distribution of the half-bred materials and finished varieties.
One of the United Nations Millennium Development Goals aim to reduce extreme hunger and poverty by half before the year 2015. Innovation in agriculture is one of the methods to reach this goal, charging breeders and other agricultural researchers worldwide with an important responsibility. The new technologies may facilitate their work to reduce poverty only if they can access them.

The outcome

The issue of IPRs in public research was tackled from different generic angles, including ethics - the role of science and academia in society - and political economy, but moved quickly to more practical levels. It was argued that public research organisations generally use patent protection as part of three strategies; maintaining their position at the frontier of science through maximizing their own freedom to operate, strengthening their position in public private partnerships, and obtaining a return on investment on their research through cash income. Humanitarian use licenses have been used to make individual technologies available for research for development. Wageningen UR has done so in a couple of projects, but it does not have a corporate strategy on the issue. Ideally, such licenses are generic, rather than dealing with individual transfers. Defining what 'humanitarian use' exactly entails and how it can be enforced in case of misuse remains complex.
Such openings often require explicit action and communication to facilitate actual technology transfer. The strategies of the 'Public sector Intellectual Property Resource for Agriculture' (PIPRA) were presented as a model. PIPRA pools fragmented public sector IP and includes it in a searchable database, and bundles different technologies in packages to facilitate use. This is complemented by capacity building and IP research. It was argued that the model does not include a whole body of not-patented knowledge. Open-source is another model for increasing access and reducing transaction costs. This model supports the sharing of innovations on the condition that any further improvements on the technology are also shared without costs. A philosophy of innovation in networks with weak –informal ties, as

opposed to a linear organisational structure with formal contracts, would underlie an 'open innovation system'. It was argued that the large genomic programmes develop into quasi open source communities through the inclusion of large numbers of partners that share their results. Open-source sharing can be complementary with a more conventional patent-like protection of other research data, making embarking on open-source systems a less radical departure from common practice. Despite various initiatives to promote open source strategies, the models do not appear to gain much importance in more product oriented biotechnology research. In discussing, the limitations of current IP management in Wageningen, and the relevance of humanitarian licenses, patent pools, or open-source strategies, a number of other issues arose. First of all, patents in Europe represent only a minor mechanism for technology transfer. Increased access to information (publications) and various forms of capacity and institution building are important mechanisms to transfer technologies and facilitate their use. Secondly, the scope of the problem was placed in perspective by questioning the relevance of patents for plant breeding. Few patents are relevant in potato breeding where the private sector favours breeder's rights which keep new plant varieties available for further breeding, and claims it does not to seek profit from poor farmers in developing countries. Finally, the crucial role of research funding organisations was indicated, in setting the rules for the valorisation of public research outputs. While a general agreement on the importance of 'science for impact' was reached, it was argued that patenting is clearly not the only – nor always the most appropriate – way of valorising the outcomes of public research.

An outlook

The importance of patents in the field of plant breeding in the future is not very clear. If current trends in the extension of the patent system continue, the restrictions on freedom to operate are likely to get worse. However, at the same time, recent developments can be observed in the major patent offices (notably EPO), questioning and challenging the current patent systems for biological systems. This may have very important consequences for the legal and policy environment in which public research institutes such as Wageningen UR, and their public funding agencies operate, and therefore for the problems that have been discussed during this conference. Nonetheless, Wageningen UR has to deal with and respond to the current IP landscape, and its limitations. Since the Institute is currently discussing its corporate IPR policy, the debate was considered very timely and useful. The outcomes of the meeting will be taken into account in this process and may fuel the debate in other universities in the Netherlands and beyond. //

A novel way to reduce the costs of tissue culture

Geert-Jan de Klerk

Tissue-cultured plants are expensive because micropropagation is labour-intensive. A new way to reduce labour costs is tissue culture in darkness. Shoot cultures grown in darkness, if necessary with an adapted medium, can be more easily processed. Propagation via roots cultured in darkness can be robotized.

Vegetative propagation in tissue culture has great advantages over conventional methods such as rooting of cuttings, layering etc. In vitro multiplication is fast, because each year not just one, but a number of propagation cycles can be carried out (up to 12 or more), and because added plant growth regulators direct growth towards increased propagation. Besides speed, other advantages are the need for only a small amount of starting material (usually just a small piece excised from the parent plant), absence of pathogens in micropropagules (provided that the appropriate measures have been taken), improved vigour and increased uniformity.

Cheaper tissue-cultured plants

The costs of tissue culture have initially been reduced by streamlining in the laboratory, automation of some of the activities such a medium preparation, and transfer of production to low-wage countries. A major reduction will be achieved by automation of subculturing. There have been many attempts to robotise the actions of the operations in the laminar flow-bench but this was found too complex. The main reason for this is that vision recognition is very difficult, because the plantlets grow in a complicated and compact way and also each cultivar has its own, specific morphology. Thus, it has been attempted to adapt the type of growth of plantlets in vitro in such a way that it is easy to robotise. The best-known effort is propagation via somatic embryos from cell suspensions. With some crops such as coffee and cyclamen, tremendous progress has been made, but with most crops insurmountable problems have still occurred.

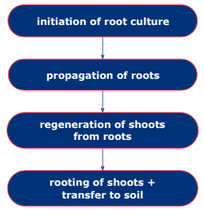

Figure 2. The successive steps in micropropagation via root cultures

Tissue culture in darkness

Some years ago, Plant Research International in the Netherlands made a desktop study on novel ways to reduce costs. One of the outcomes was that growing tissue culture in the dark might be interesting to explore. It was thought that culture grown in darkness may lead to cost-reduction by lowering the energy costs. Most importantly, it was considered it would also lead to reduced labour costs: processing is more easy and fast as a result of the simpler morphology in the dark. Two approaches were chosen. So shoot culture in the dark and propagation via root culture were explored.

Figure 1A.The reduction of elongation by paclobutrazol, an inhibitor of gibberellin synthesis.

The research was carried out by eight tissue-culture companies and by Plant Research International (PRI). PRI used Zantedeschia and Pelargonium in the research on shoot and root culture, respectively.

Shoot culture in the dark

It is well known that plants that grow in dark 'etiolate': they become very long and white. In many crops, etiolation is undesirable because the plantlets become difficult to handle and especially sterility becomes a problem. However, in crops that grow very stockily in tissue culture, etiolated material may be easier to process. Etiolation has been examined extensively in scientific literature. Some years ago, it was believed that a new class of plant hormones, brassinosteroids, play a major role, but now most researchers feel that gibberellins are most important. We also found that brassinosteroids do not have a major role in etiolation. Reduction of the synthesis of brassinosteroids by imazalyl, a compound that is used as fungicide, had no consistent effect on etiolation in Zantedeschia and resulted in bushy plants after planting in soil. With gibberellin-synthesis inhibitors, a satisfactory inhibition of etiolation was achieved (Fig. 1a). It should be noted that the paclobutrazol-grown propagules are easier to process, and seem to be more suitable for vision recognition. In Zantedeschia, paclobutrazol had a favourable after-effect: propagules produced with paclobutrazol-medium showed increased corm-formation in the greenhouse (Fig. 1b). In total, 13 crops have been tested for shoot culture in the dark and 9 gave satisfactory or good results.

Acknowledgements
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Figure 1B. Zantedeschia shoot culture in darkness. Zantedeschia plantlets after three months of growth. The plantlets have been produced in the dark with increasing concentrations of paclobutrazol. Note the enhanced tuber formation with paclobutrazol.

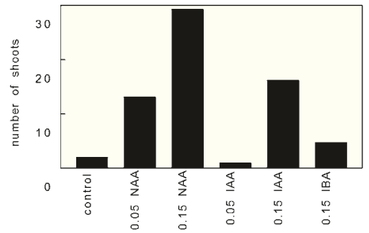

Figure 3. The effect of preculture on the capacity of Pelargonium shoots to regenerate shoots.

In tissue culture, usually incomplete plants are grown: for example shoots without roots. Organs of plants that normally grow in the dark, might be suitable targets for tissue culture in the dark. The relevant organs include bulbs, corms and roots. Since only roots occur in all plants, they were chosen for research. The procedure is shown in Figure 2. After initiation of the root culture, large quantities of roots are produced. After that, shoots are regenerated from the roots. Root culture can be easily robotised. Because shoots regenerate from pericycle cells, and pericycle cells are meristematic to some extent, the problem of variation is generally minor. It is interesting to note that the first genuine tissue culture was carried out with tomato roots by White in 1939. Research on root culture has been done up to 1955. Research was restarted in the 1980s but with roots transformed with Agrobacterium rhizogenes. The so-called 'hairy roots' grow excellently. Since transformation is not an option, we used non- transformed roots. In many crops, though, we encountered severe problems with growth of excised roots. Improved growth was achieved by a short period of culture with auxin at the beginning of a culture cycle (Fig. 3) and by adding amino acids. The backgrounds of the auxin-effect may be that auxin induces the formation of lateral roots. If auxin remains present for a long period, it inhibits the growth of roots. Accordingly, the effect was strong with an unstable auxin (IAA) whereas the stable auxin NAA had no effect. The opposite effect of auxin, promotion in the initial phase and inhibition later on, is well-known from experiments on adventitious root formation. Regeneration of shoots from roots occurs frequently in nature (suckers) and root cuttings are used in nurseries for commercial propagation of many crops. The latter can only be achieved in crops with lignified roots because only these are sufficiently strong to survive ex vitro when excised. Many scientific papers report shoot regeneration of shoots from non lignified roots in vitro. However, in our hands regeneration of shoots from roots proved to be difficult and extensive research was carried out to improve regeneration. We found that regeneration depends on the type of cytokinin. Surprisingly, zeatin gave better results than benzylaminopurine. Thidiazuron also gave good results. The auxin transport inhibitor triiodobenzoic acid improved regeneration in pelargonium. A major factor was the preculture. After the short preculture with auxin, mentioned before, not just root growth but also the capacity of roots to regenerate shoots was strongly enhanced (Photo 2). Unfortunately, when roots were grown with the addition of amino acids (the second procedure that increased root growth) regeneration capacity was much reduced. In conclusion, the route via root culture proved to be more difficult then shoot culture in the dark. From the 12 crops that were tried, only 5 showed good/satisfactory results.

Conclusion

Shoot culture in darkness may be a viable alternative for normal shoot culture in many crops. The most promising method to achieve robotization, is propagation via an intermediate phase of root culture, proved to be too difficult. Nevertheless, this may become a broadly used, new method when the two bottlenecks, establishment of a rapidly growing root culture, and abundant shoot regeneration from these roots, have been solved. Supposedly, propagation via root culture will produce less off-types than propagation via somatic embryos and cell suspension. //


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