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Fast Forward - meeting abstracts

Forty years of 'Gewasbescherming' Where are we now and where are we heading for?

Lammert Bastiaans, Jan-Kees Goud and Gert Kema

KNPV

The national journal 'Gewasbescherming', issued by the Royal Netherlands Society of Plant Pathology (KNPV), has its fortieth anniversary this year. The journals' and the Society's mission is to build bridges between crop protection research, extension, application and practice, education and policy making. The spring symposium is organized to celebrate the fortieth volume of the Society's newsletter. During the morning, a plenary session is planned that will briefly mention important developments that have taken place during the past four decades. Forty years ago, the discussion on the continuation of the central role of chemical compounds in crop protection had only just begun. Today the regulation of these compounds at national level and within the context of the EU is still creating a lively debate. Does it offer farmers and industry enough opportunities to survive and are environmental values and food safety sufficiently secured? Organic agriculture took off as an alternative. Still some persistent pests are causing major problems. Are sufficient alternatives available for safeguarding the survival of some important crops in organic crop rotations? Integrated crop protection was developed as the 'polder'-variant and an attempt to combine the best of both worlds. But is there clear consensus on the role of chemistry in this approach? Should it be used for early pest suppression or only as a last resort when all other measures have failed. Resistance breeding has always been important, but clearly received a new impulse through the options offered through genetic modification. Large scale application of these modern technologies is still hindered by concerns raised by society. Are these justified? Or perhaps more importantly, can these worries be dismantled? These examples illustrate the need to build bridges between the various stakeholders in the crop protection arena and clearly justify the existence of Gewasbescherming for many more years to come. Today's symposium will not only inform on what was going on, but more importantly invites to discuss on: Where are we now and where are we heading for?

Keynotes

Bringing plant potential to life in a changing world

Jan Bouwman

Syngenta Crop Protection, the Netherlands

The growing and increasing affluent world population, diets changing by increasing wealth, and the issue of food versus fuel argues for greater productivity to meet the needs. The resources available for crop production continue to be under pressure. The amount of farmland will reduce and water is becoming scarce in many parts of the world.
Production will have to double to meet the future demands. We can only grow more food from less land by providing farmers with innovative technologies and the knowledge to use land and water more efficiently and to conserve biodiversity.
Agri-technology investing in seed and crop protection can bring this plant potential to life.
Regulation that is not science-based will stifle innovation and limit the ability of farmers to grow more food with limited natural resources.
We believe that in partnership with farmers, government and other stakeholders we can unlock the boundless potential of plants.

Mededelingenblad van de Koninklijke Nederlandse Plantenziektekundige Vereniging

What will be the development of regulations in the near future?

Bart Bosveld and Folke Dorgelo

Board for the authorisation of plant protection products and biocides
Corresponding author is Bart Bosveld, Board director

The new regulation on the marketing of plant protection products is expected to come into force in the summer of 2009. The regulation will be applicable 18 months later, the end of 2010/ start of 2011. This regulation is part of a package with the directive on the sustainable use of pesticides and the directive on pesticides statistics. The regulation is focussing on the harmonisation of the *European* assessment of active substances (including safeners, synergists, co-formulants and adjuvants) and the *national* authorisation of plant protection products based on these active substances. Important items in the regulation are the *mutual recognition* of authorisations (with attention to specific national criteria), *zonal areas* in Europa and *data protection*. Due to the directive on sustainable use, the member states will develop national action plans (NAP) to deal with integrated pest management (IPM), non-chemical alternatives, biological pest treatment, precautionary principle, equipment etcetera.

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Cisgenesis for durable resistance

Henk J. Schouten

Wageningen University and Research Centre, Plant Research International,
P.O. Box 16, 6700 AA Wageningen, the Netherlands

Introgression of traits from wild germplasm into pip fruit cultivars by means of classical breeding is painstakingly slow. Introgression of, for example the apple scab resistance gene *Vf* from *Malus floribunda* 821 into marketable top quality apple cultivars took more than 50 years. In the mean time *Vf* resistance has been compromised by new virulent races of *Venturia inaequalis* in northern Europe. For durable resistance more than one resistance gene should be combined. However, this may take many years. This slow tempo is caused mainly by the long juvenile period and by linkage drag of hundreds of undesired alleles. The process would be much faster if only the allele of interest were inserted, without the other alleles from the wild germplasm. This process is named "cisgenesis". Cisgenesis would allow rapid accumulation of resistance genes or other desired alleles from wild sources.
We have defined cisgenesis as genetic modification of plants, inserting genes of the plant species itself or from crossable relatives. The gene should contain its native introns and be flanked by its native promoter and terminator in sense orientation. A cisgenic plant does not contain genes from outside the gene pool of the conventional breeder. If the plant does contain foreign genes, the plant is named transgenic. Scientific inquiries indicate that acceptance by consumers is better for cisgenic plants than for transgenic plants.

As the phenotypic traits from cisgenesis can in principle also be obtained by means of conventional breeding, induced translocation breeding or mutation breeding, cisgenic plants are at

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least as safe as conventionally bred plants, or plants from induced translocation breeding or mutation breeding. Therefore we propose to add cisgenesis of plants to the list of GM technologies that are exempted from the GMO regulation in the European Union (Annex 1B of Directive 2001/18/EC).

The number of functionally analysed genes in fruit trees is increasing, and will be boosted further by combining whole genome sequences with known genetic loci for interesting traits, gene expression data, and ESTs. Also technologies are available for either introduction of alleles without use of marker genes, or for later excision of marker genes, such as kanamycin resistance gene, the so called "marker-free" technologies. Cisgenesis combines the knowledge of gene sequences and their functions with marker-free technologies.

Cisgenesis is an approach for utilizing the growing wealth of knowledge of plant genes to the benefit of the society in a fast, safe and acceptable way.

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Parallel sessions
Session Resistance

Finding more resistance sources to septoria tritici blotch of wheat

S. Mahmod Tabib Ghaffary, Theo A.J. van der Lee, Els C.P. Verstappen and Gert H.J. Kema

Dept. Biointeractions and Plant Health; Plant Research International B.V.; visit: building 107, Droevendaalsesteeg 1, 6708 PB Wageningen, the Netherlands

Septoria tritici blotch (STB) is caused by *Mycosphaerella graminicolla* and is among the most devastating worldwide foliar blights of wheat. STB consistently reduces yields by 10-15% and under conducive conditions up to 50%. Fungicide control of the disease is not sustainable due to abrupt (strobilurins) or gradual (azoles) fungicide resistance development. Therefore, breeding for resistance is the most effective control strategy to this disease. Up to 15 major resistance genes and QTLs, *Stb1-Stb15*, were recently identified and are being used in breeding programs. However, the resources to combat this disease are still very limited and we therefore started a survey to identify new sources of resistance. Candidate genes are being mapped and molecular markers to facilitate application in breeding programs will be developed. We explored STB resistance in 48 hexaploid wheat lines, including synthetic hexaploids, using a global panel of 18 *M. graminicola* isolates. New *Stb* genes were postulated and are currently being characterized and mapped. It was of particular interest that synthetic hexaploid lines showed a broad resistance to the entire *M. graminicola* panel.

Mededelingenblad van de Koninklijke Nederlandse Plantenziektekundige Vereniging

Efficient targeting of barley genes for basal resistance to Puccinia hordei

Thierry C. Marcel[1], Freddy K.S. Yeo[1], René Kuijken[1], Romain Bouchon[1], Alice Lorriaux[1], Christine Boyd[2] and Rients E. Niks[1]

[1] Laboratory of Plant Breeding, Graduate school for Experimental Plant Sciences, Wageningen University, Droevendaalsesteeg 1, 6708 PB Wageningen, the Netherlands
[2] Washington State University, Pullman, WA 99164, USA

Basal resistance is the complement of the term "basic compatibility". Evidence suggests basal resistance to be a weak form of non-host resistance, resulting from the partial failure of the microbe to deal effectively with the defence that plant species mount against maladapted microbial intruders. With rust and mildew fungi, basal resistance hampers the formation of fungal haustoria and is due to genes with relatively small, quantitative effects, located on so called quantitative trait loci (QTL).
The barley populations Steptoe/Morex and Oregon Wolfe Barleys vary quantitatively, without hypersensitive reaction, in their level of resistance to the biotrophic leaf rust fungus *Puccinia hordei*. Each population segregates for a different set of QTLs from which the most effective QTL-alleles for resistance that have been detected in seedlings are *Rphq11* in Steptoe and *Rphq16* in Dom. *Rphq11* and *-16* are not effective in adult plants grown in greenhouse or in the field. Steptoe and Dom were crossed and backcrossed with a susceptible barley line and individual F3 or BC1 plants were selected that contain the resistance allele of *Rphq11* or *-16* but none of the other resistance QTLs that the donors possess. The effect of each QTL was confirmed in F_4 or BC_1S_1 families and their precise position determined by substitution mapping.

The strategy followed allowed a quick fine-mapping of the genes underlying two resistance QTLs at a sub-centiMorgan level without the tedious need of developing near-isogenic lines and required using only a handful of molecular markers flanking the QTLs. This work will permit to identify soon the physical location of those two genes on the barley genome.

Resistance testing and occurrence of pathotypes in Synchytrium endobioticum: an overview.

Gerard van Leeuwen, André Tonk & Patricia van Rijswick

National Reference Laboratory, Plant Protection Service, Wageningen; e-mail: g.c.m.van.leeuwen@minlnv.nl

In EU Directive 69/464/EEG it is mentioned that each country should yearly publish a list of potato cultivars resistant to pathotypes of *S. endobioticum*. Hereto, it is compulsory to do a laboratory test, of which two tests are extensively described in the literature: the Spieckermann-test (Spieckermann & Kothoff, 1924) and the Lemmerzahl-test (Lemmerzahl, 1930). In the Netherlands the Spieckermann-test is used in official resistance testing. Inoculum consists of winter sporangia (resting spores) mixed with sand. Eye pieces of potato are covered with this mixture, and subsequently moistened. Zoospores released after germination of the winter sporangia are responsible for infection. Susceptible cultivars react with wart formation (no defense), those resistant react with forming a necrotic region surrounding the infection site. In the Lemmerzahl-method, fresh wart tissue is used to infect eye pieces of potato. Then, summersporangia freely releasing zoospores cause infection. It is believed that the Lemmerzahl–test is more sensitive, i.e. more cultivars are rated 'susceptible' after testing, this in comparison with the Spieckermann-test.

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