BIOGRAPHICAL DATA

Name and degree	**DR. MARC VAN MONTAGU**
Born	**10 November 1933** **G**hent**, BELGIUM**
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PRESENT POSITION

- Emeritus Professor – Ghent University
- Founder and Chairman of VIB-International Plant Biotechnology Outreach, Ghent University

ACADEMIC EDUCATION

- M.Sc. Chemistry; Organic Chemistry (Ghent University, 1955)
- PhD, Organic Chemistry/Biochemistry (Ghent University, 1965)

PRESENT FUNCTIONS IN FUNDAMENTAL & APPLIED RESEARCH

- Advisor to the Flemish Institute for Biotechnology (VIB), Ghent, Belgium, since 1999
- Chairman of the Scientific Advisory Panel of FuturaGene (Israel/Brazil), since 2011
- Member of the Scientific Advisory Board CTC S.A. (Brazil), since 2015; and BGI/ICG (China), since 2016.

PRESENT FUNCTIONS IN SCIENCE POLICY

- President of the Public Research & Regulation Initiative (PRRI), Delft, Holland and Brussels Belgium, since 2005

FORMER EDUCATIONAL AND UNIVERSITY FUNCTIONS

- Director of the Bureau d'Étude, Technical School for the Nuclear Industry, Mol, Belgium (1956-1960)
- Full Professor, Molecular Genetics, Ghent University, Belgium (1985-1999)
- Director of the Department of Genetics, Ghent University-Flanders Institute for Biotechnology (VIB), Belgium (1979-1999)
- Part-time professor at the Free University of Brussels (VUB) (1972-1989)

FORMER FUNCTIONS IN FUNDAMENTAL & APPLIED RESEARCH

- Member, Board of Directors and Scientific Advisor of Advanced Genetic Sciences (AGS), Oakland California, US, 1979-1986.
- Founder, Scientific Director and member of the Board of Directors of Plant Genetic Systems N.V., 1982 - 1996
- Founder and Member of the Board of Directors of CropDesign (Belgium), 1998 – 2004
- Member, Board of Directors of Avesthagen (Bangalore, India), 1999 – 2010
- Member, Science Advisory Committee/Council
    - Institute of Molecular Biology and Biotechnology (Heraklion, Crete)

    - International Advisory Board at King Abdulaziz University (Jeddah, Kingdom of Saudi Arabia), 2010-2012
    - International Centre for Genetic Engineering and Biotechnology (ICGEB), Trieste, Italy, 2000- 2013
    - Alellyx (São Paulo, Brazil), 2003-2009
    - CIB-CSIC (Centro de Investigaciones Biológicas), Madrid, Spain, 2007-2009
    - Scientific Advisory Board of Instituto Tecnológico Vale (Brazil), 2013-2019
- Chair, Scientific Advisory Committee Danforth Centre (St. Louis - USA), 1999 – 2010
- Member of the Board of Trustees of the International Institute of Tropical Agriculture (IITA) (Idaban, Nigeria), 1991-1995
- Scientific Advisor
    - Tibotech (Belgium),
    - Extracta (Rio de Janeiro, Brazil), 1998-2008
- Biotechnology advisor
    - ICARDA (International Centre for Agriculture Research in Dry and Arid Areas) (Aleppo, Syria), 1998-2006
    - Board of Governors and Scientific Advisory Board of Weizmann Institute of Science, (Rehovot, Israel), 2001-2010

FORMER FUNCTIONS IN SCIENCE POLICY

- UNIDO Goodwill Ambassador for Agribusiness, 2015-2017
- President of EFB (European Federation of Biotechnology), 2003-2015
- President of BSBA (Black Sea Biotechnology Association), 2004-2014
- Belgian Representative in the Biosciences Steering Panel of EASAC (The European Academies Scientific Advisory Council), 2010-1014
- Member, Advisory Board (EGLS) of EU Commissioner Ph. Busquin, DG - Science and Technology, European Commission, 2000-2004
- Belgium Delegate at the International Council of Science (ICSU) (Paris), 1989-1996
- Chair of Cobiotech/ACOGEB, ICSU Bodies for Biotech Research, 1993-1996
- Board of Trustees of IITA (Ibadan, Nigeria), 1991-1996
- Selection Committee Member
    - King Baudouin International Development Prize, 1990-1998
    - L'Oréal-UNESCO For Women in Science (Paris, France), 1998-2015
    - Balzan Prizes, International Balzan Foundation (Milan, Italy), 2004-2016

HONOURS

- Baron, title granted by Baudouin I, King of the Belgians – 1990
- EMBO fellow 1978
- Foreign Associate, The National Academy of Sciences of the USA - 1986
- Belgian Royal Academy of Sciences - 1987
- Academia Europea - 1989
- Agricultural Academy of Russia - 1991
- The Academy of Engineering of Sweden - 1992
- Agricultural Academy of France - 1992
- The Royal Academy of Overseas Sciences, Belgium -1997
- Italian Academy of Sciences Dei XL - 1998
- American Academy of Microbiology - 1999
- Third World Academy of Sciences (TWAS) - 2001
- Foreign correspondent, Brazilian Academy of Sciences - 2013
- Doctor Honoris Causa of the Universities of Helsinki (Finland) -1990; Compiegne (France) - 1995; Rio de Janeiro (Brazil) -1997; Liege (Belgium) - 1997; Brussels - ULB (Belgium) -1997; Habana (Cuba) - 1999; Sofia (Bulgaria) – 2004; UIMP, Santander (Spain) - 2015; Weizmann Institute (Israel) - 2018)

- Francqui Chair at the Catholic University of Louvain, Faculty of Medicine (Belgium) -1971- 1972; Free University of Brussels -ULB, Faculty of Sciences (Belgium) - 1986 -1987; and Catholic University of Louvain, Faculty of Sciences (Belgium) - 1994 - 1995
- Theodor Bücher Medal (FEBS) - 1999
- Iran Agriculture Gold Medal – 2015

AWARDS

- Rank Prize for Nutrition (The United Kingdom) - 1987
- IBM-Europe Prize (France) -1988
- The Charles Leopold Mayer Prize (Academy of Sciences, France) - 1990
- Dr. A. de Leeuw-Damry-Bourlart Prize (five yearly prize of the Belgian National Fund for Scientific Research) - 1990
- Japan Prize (Japan) – 1998
- Elected by his peers and through independent polls conducted by Reed Exhibitions, a division of Reed Elsevier, as one of the Top 100 Living Contributors to Biotechnology - 2005
- Genome Valley Excellence Award 2009 (BioAsia, India) – 2009
- The World Food Prize – 2013
- Elected as one of the 100 visionaries who continue to reshape biotechnology - and the world, Scientific American Worldview - 2015

ACHIEVEMENTS

Fundamental Research

- Discovery of the Ti-plasmid, functional mapping of the Ti-plasmid and its role in the mechanism of gene transfer from *Agrobacterium tumefaciens* to plants
- Pioneering contributions on plant gene discovery and regulation
- Major contributions in the studies of plant molecular mechanisms of response to abiotic stresses (high light, ozone, cold, salt and drought)
- Major contributions in the identification of Arabidopsis genes involved in growth, development and flowering.
- Mentor of more than 100 PhD students from all over the world

Applied Research

- Development of methods to alter *Agrobacterium* into an efficient delivery system for gene engineering in plants
- Founder of two start-up biotech companies - Plant Genetic Systems (PGS) and CropDesign
- Construction of the first plants producing the *Bt* (*Bacillus thuringensis*) insecticide (at PGS)
- Construction of the first herbicide tolerant plants (at PGS)
- Engineering of poplar trees with improved pulping qualities (altered lignin composition)

Publications

- Scientific journals with review process: 649; Chapters in books and proceedings of conferences with review process: 263; Journals without review process: 259; patent applications: 36. (Total list of publications http://ipbo.vib-ugent.be/about-us/team/marc-van-montagu).
- Ranked as the most cited scientist in the field of Plant & Animal Science 1995-2004.

- Since 1981 the totality of the scientific publications has received 108,759 citations (*h*-index: 172) (Google Scholar 18/05/2020). Web of Sciences (18/05/2020) scores 67,916 citations for 763 scientific articles (*h*-index: 135).

MARC VAN MONTAGU – RESUME OF ACHIEVEMENTS

Marc Van Montagu is recognized as a world's leading plant biotechnologist. His international intellectual leadership and field-defining discoveries have steered the development of plant biotechnology.

The celebrated discovery of the Ti-plasmid of Agrobacterium tumefaciens (**1,2**) by Marc Van Montagu, Jeff Schell and their team at Ghent University is a classic case of curiosity-driven research that ultimately led to major scientific breakthroughs. The finding that Agrobacterium oncogenicity and virulence were determined by a mobile, extrachromosomal element was revolutionary and led to the discovery of a natural mechanism of gene transfer from Agrobacterium to plants. Their landmark research laid the foundation for establishing a major tool for plant genetic engineering and opened up hitherto unforeseen tools enabling plant molecular biology studies and quantum leaps in fundamental and applied knowledge in the plant sciences.

Immediately after discovery of the Ti-plasmid, a worldwide effort was launched to unravel the molecular basis for tumorigenicity, and the group of Jeff Schell and Marc Van Montagu continued to dominate the field. The Ghent team used transposon insertion and deletion mutations to disclose the functional organization of the nopaline pTiC58 (**3**) and octopine pTiB6S3 Ti-plasmids. The first genetic evidence in favour of a DNA transfer model came from the demonstration that genes controlling opine synthesis in transformed cells were localized in the Ti-plasmid. The then novel technique of Southern-blot showed that a DNA segment highly conserved in all Ti-plasmids (T-DNA) was present in tobacco crown-gall cells, firmly establishing that DNA transfer from bacterium to plants does occur. Functional mapping experiments further revealed that the genes encoding for opine biosynthesis as well as the genes that allow tumorous growth (plant hormones) were mapped in the T-DNA, and that no mutation in the T-DNA could block T-DNA transfer. All genes affecting the process of T-DNA export to the plant cell mapped in the so-called vir region, outside the T-DNA borders. Adding quickly to this discovery, at a time when little was known about DNA sequence determinants for heterologous integration, a 25-basepair direct repeat on the Ti plasmid was identified at the borders of what is incorporated into the plant genome (**4**). It was also shown that these sequences define T-DNA on the plasmid. At the same time, elegant cell fractionation analyses revealed that the T-DNA integrated into the nuclear, and not the chloroplastic or mitochondrial, genome of plants.

As soon as the structure and function of the Ti-plasmid was understood, the concept that the plasmid could be used to deliver novel genes into plants was born, paving the way to the first transgenic plants. Van Montagu and Schell labs published in 1980 and 1981 the first deliberately made transgenic plant that expressed and transmitted an Agrobacterium gene as dominant Mendelian trait (**5**).

Conversion of the Ti-plasmid of Agrobacterium into a gene vector progressed in multiple stages. Co-integration was used to manipulate and recombine genes of interest into the T-DNA of the large Ti-plasmid. Such co-integrated vector system was also used to develop the first transgenic plants (**6**).

In 1983 Schell and Van Montagu's, Fraley's, and Chilton's groups simultaneously announced, at the 15th Miami Winter Symposium, the success in the use of Ti-derived plant gene vectors, antibiotic selection of transformants, and regeneration of fertile plants that passed on the chimeric gene in a stable and Mendelian manner to their progeny (**7**). Only nine years after the discovery of the Ti-plasmid, the "Golden Era" of plant molecular genetics had begun and the development of plant transgenic technologies would expand dramatically in the nineties.

Molecular technologies have evolved and new genome editing methods offer accuracy not possible with earlier methods. Yet, these new approaches still involve gene transfer technology and, three decades after the firsts transgenic plants were produced, Agrobacterium-mediated plant transformation continues to be an essential tool in the palette of techniques which are enabling further cutting-edge research and development in plant sciences and biotechnology.

The Impact of the discoveries on plant sciences and plant biotech

Agrobacterium is an extremely interesting biological system and its study has led to many fundamental insights on plant-microbe interactions. The induction of *vir* genes by plant phenolics was one of the first examples of communication between microbes and plants in the soil environment (**8**).

The recognition that bacterial genes could integrate into the plant genome and direct the synthesis of plant growth regulators, thereby creating the microenvironment (the tumour) for their growth, was revolutionary and formed the basis for much of what we know about horizontal gene transfer. In the postgenomic era, we now know that horizontal DNA transfer is responsible for a great deal of adaptive responses and invasive behaviour, and that the genomes of living organisms are much more fluid than previously imagined. Recent works have shown that gene transfer from agrobacteria to various plant species had occurred under natural circumstances. Several Nicotiana, Linaria and Ipomoea species carry T-DNAs (called

cellular T-DNA or cT-DNA) from Agrobacterium spp. into their genomes. The pattern of acquisition of cT-DNAs is consistent with the idea of speciation by transformation.

For the academic world, Agrobacterium-mediated plant transformation allowed researchers to study plant processes through gain of function and enabled a systematic and refined analysis of the impact of single genes on all aspects of plant biology. In the early years, the technology was applied in model plants, such as Nicotiana tabacum and Arabidopsis thaliana (**9**). Much of today's detailed knowledge of how plants grow, develop and respond to pathogens or abiotic stresses, as well as gene regulatory mechanisms such as RNA gene silencing have been unravelled by creating transgenic plants through Agrobacterium-mediated transformation. The laboratory of Marc Van Montagu has given pioneering contributions on plant gene discovery and regulation, plant molecular mechanisms of environmental sensing and response to abiotic stresses, plant development and gene silencing.

Marc Van Montagu has also been both visionary and highly productive in the translation of his basic research to products for society. He was the founder of two of the most successful agbio start-ups in the world and, through this pioneering step forward, the development of transgenic crops resistant to insect pest (**10**) and tolerant to environmentally benign herbicides were possible (**11**). Other contributions of Marc Van Montagu to applications in plant biotechnology include the development of poplar trees with higher lignin extractability to pulp and paper industry.

The prompt adoption of Agrobacterium-mediated plant transformation by the scientific community, followed by a worldwide boom of academic and industrial laboratories focusing on plant biotechnology, are evidences of the real impact of Agrobacterium-mediated gene transfer. Marc Van Montagu's remarkable scientific career has left an enduring footprint in plant sciences. For 10 years (1995-2004) he was ranked number 1 on the ISI citation index for plant and animal scientists and even eighteen years after his retirement as director of the Laboratory of Genetics at the Ghent University he upholds an average of more than 3400 citations/year (Google Scholar). Prof. Van Montagu's is widely recognised as a leading plant biotechnologist which has inspired generations of scientists worldwide to engage in plant research. His lab has been an incubator for hundreds of scientists, many of them in leading positions in academic institutes and agricultural companies.

Plant gene engineering has triggered many innovations that clearly have the potential to lead to a major new agricultural revolution based on the harnessing modern scientific techniques. The development of the first generations of GM crops were motivated by a need to increase yield, reduce crop losses to pests and diseases, and decrease agrochemical use. It became the fasted adopted crop technology of recent times because it generates significant economic benefits to farmers. Notably, the highest economic gains are obtained by farmers in developing countries, many of which are resource-poor and farm small plots of land. This has a direct impact on poverty alleviation because resource-poor farmers and the rural landless dependent on agriculture represent the majority of the world's poorest people. The adoption of GM crops allowed the use of environmentally friendly farming practices such as less ploughing and fewer pesticide spray, contributing towards sustainability in agriculture. Significantly, the adoption of GM crops has conserved biodiversity by removing million hectares from agriculture. So far only a small range of crops with a few GM traits have been commercialized. Much more will be realized. A wide variety of useful genes have been transformed into a large number of plants, including most of the food crops, scores of varieties of fruits and vegetables, and many tree species. Output traits with improved quality and composition geared towards nutrition, as well as pharmaceuticals and biopharmaceuticals are of special interest to human health. A lot more can and should be done, in particular to achieve food security in low-income countries.

Marc Van Montagu's activities tackle many questions with far-reaching societal implications. As important as science per se is the societal recognition of the value of science to humanity and the environment. Plant biotechnology can provide tools to face issues of food security, malnutrition and climate change mitigation. The promotion of knowledge and technology to each corner of the world are vital for addressing grand societal challenges. Marc Van Montagu has been especially active on capacity building in low- and middle-income countries and, in 2000, he created the International Biotechnology Outreach (IPBO), now a VIB cell at Ghent University with the mission to empower less developed regions with the latest technological developments and effective science-based biosafety regulatory mechanisms.

Cited papers

1. Zaenen, I., Van Larebeke, N., Teuchy, H., Van Montagu, M. and Schell, J., (1974), Supercoiled circular DNA in crown-gall inducing *Agrobacterium* strains. J.Mol.Biol. 86: 109-127 Cited by (Google Scholar: 566) (Web of Science: 354).

    Agrobacterium tumefaciens is a plant pathogen that has the unusual ability to cause infected plant cells to proliferate and form a tumour. The bacterium itself is not detected intracellularly in plant cells or in the cells of sterile crown-gall tumours grown in vitro even in the absence of growth hormones for many years. This observation led to the postulation, in 1947, of a tumour-inducing principle (TIP), that would be transferred by the bacterial to the plant cell to

induce transformation. Much work ensued in order to identify the TIP without success. Van Montagu, Schell and co-workers explore the possibility that TIP was in a bacterial plasmid by caring out a systematic search for the presence of a plasmid DNA in a number of pathogenic and non-pathogenic strains of *A. tumefaciens.* This work culminated in the discovery of a large 200 Kb supercoiled plasmid in all virulent strains. Until this point, the existence of such large bacterial plasmids had never been considered. This plasmid was not detected in any of the eight avirulent strains tested. This landmark discovery prompted a worldwide intensification of efforts to prove directly that these plasmids were responsible for the tumour-inducing capacity of their host strains. Schell and Van Montagu named these plasmids Ti (Tumour-inducing) plasmids

2. Larebeke, N. VAN, Genetello, C. H., Schell, J., Schilperoort, R. A., Hermans, A. K., Hernalsteens, J. P. & Van Montagu, M. (1975). Acquisition of tumour inducing ability by non-oncogenic Agrobacteria as a result of plasmid transfer. Nature, London 255: 742-743 Cited by (Google Scholar: 273) (Web of Science: 199).

   Direct proof that the Ti plasmids were responsible for the tumour inducing capacity of their host strains by demonstrating that non-oncogenic *A. tumefaciens* strains could acquire virulence as a result of plasmid transfer. Schell and Van Montagu were quick to grasp the concept that the Ti plasmid could be used to deliver novel genes into plants, and with that came the distinct possibility that the complete molecular dissection of plant physiology through target manipulation of plant gene.

3. Holsters, M., Silva, B., Van Vliet, F., Genetello, C., De Block, M., Dhaese, P., Depicker, A., Inzé, D., Engler, G., Villarroel, R., Van Montagu, M., and Schell, J. (1980). The functional organization of the nopaline A. tumefaciens plasmid pTiC58. Plasmid 3: 212-230. Cited by (Google Scholar: 462) (Web of Science: 353).

   This paper describes the transposon mutagenesis approach that showed: (i) genes encoding for the synthesis of the plant growth regulators auxin and cytokinin are mapped to the T-DNA; (ii) all mutations affecting tumour induction or the process of T-DNA export to the plant cell mapped to a sector of the Ti plasmid, the vir region, that is not integrated into the plant genome. These functional mapping experiments, published by the Ghent team in a series of papers were important for three reasons: Firstly, the recognition that bacterial genes could integrate into the plant genome and direct the synthesis of plant growth regulators, thereby creating the micro-environment (the tumour) for their growth, was revolutionary. This so-called genetic colonization formed the basis for much of what we know about horizontal gene transfer. Secondly, the fact that T-DNA genes drive plant growth regulator synthesis not only explained why crown gall calli can be grown on minimal media without a requirement for the addition of exogenous cytokinin or auxin, but more importantly, paved the way for a more rational understanding of how plant growth regulators function in plants and more broadly paved the way for a complete understanding of the structure and function of the plant genome, since genes in the T-DNA are not transcribed in Agrobacterium. Thirdly, understanding that no mutation in T-DNA blocked T-DNA transfer, and that all genes affecting the process of T-DNA export to the plant cell mapped in a separate replicon, the vir region, greatly simplified the prospect for disarming the T-DNA and the construction of vir region-containing plasmids lacking any T-DNA. The functional organization of a noctopine A. tumefaciens plasmid was published by the Ghent group a year later.

4. Zambrysky, P., Holsters, M., Kruger, K., Depicker, A., Schell, J., Van Montagu, M., and Goodman, H.M. (1980). Tumor DNA structure in plant cells transformed by A. tumefaciens. Science 209: 1385-1391 Cited by (Google Scholar: 256) (Web of Science: 171).

   Southern blot allowed the demonstration that only certain parts of the Ti plasmid are integrated into the plant genome (T-DNA). A 25 bp imperfect direct repeat on the Ti plasmid was identified at the edges of the Agrobacterium DNA of the T-DNA.

5. Hernalsteens, J.P., Van Vliet, F., De Beuckeleer, M., Depicker, A., Engler, G., Lemmers, M., Holsters, M., Van Montagu, M., and Schell, J. (1980). The *Agrobacterium tumefaciens* Ti plasmid as a host vector system for introducing foreign DNA in plant cells. Nature 287: 654-656. Cited by (Google Scholar: 173) (Web of Science: 99). Otten, L., Greve de, H., Hernalsteens, J., van Montagu, M., Schieder, O., Straub, J., & Schell, J. (1981). Mendelian transmission of genes introduced into plants by the Ti plasmids of Agrobacterium tumefaciens. Molecular Genetics and Genomics, 183, 209–213. Cited by (Google Scholar: 171) (Web of Science: 104).

   These papers report the first deliberately made transgenic plant. Normal Nicotiana tabacum plants from tumour tissue induced by a Tn7 insertion mutant in a T-DNA gene involved in auxin synthesis. In these plants, most of the T-DNA, including the Tn7, was deleted and only

the T-DNA gene 3, encoding octopine synthase was present, expressed and transmitted as a dominant Mendelian trait.

6. Zambryski P, Joos PH, Genetello C, Leemans J., Van Montagu M, Schell J (1983) Ti plasmid vector for the introduction of DNA into plant cells without alteration of their normal regeneration capacity. EMBO J. 2: 2143–2150 Cited by (Google Scholar: 993) (Web of Science: 544).

   The foundation of an approach to develop a host vector system by making a small T-DNA plasmid that could be manipulated and engineered directly in *E. coli* and then transformed into Agrobacterium. Such a co-integrated vector system and was extensively used to introduce DNA into plant cells.

7. Herrera-Estrella, L., Depicker, A. Van Montagu, M., Schell, J., (1983), Expression of chimaeric genes transferred into plant-cells using a Ti-plasmid-derived vector. Nature 303: 209-213 Cited by (Google Scholar: 744) (Web of Science: 325)

   A specimen of a series of publications reporting *Agrobacterium* mediated plant transformation, kanamycin selection of transformants, and regeneration of fertile plants with a chimeric gene that passed on the chimeric gene in a stable and Mendelian manner to their progeny.

8. Stachel, S.E., Messens, E., Van Montagu, M., Zambryski, P. (1985) Identification of the signal molecules produced by wounded plant cells that activate T-DNA transfer in Agrobacterium tumefaciens. Nature 318, 624-629 Cited by (Google Scholar: 1184) (Web of Science: 730).

   The identification of small signal molecules by the wounded plant tissue that can foster agrobacterium mediated T-DNA transfer and therefore facilitates plant transformation. The induction of vir genes by plant phenolics was one of the first examples of communication between microbes and plants in the soil environment

9. Valvekens, D., Van Montagu, M., Van Lijsebettens, M. (1988) *Agrobacterium tumefaciens*-mediated transformation of *Arabidopsis thaliana* root explants by using kanamycin selection. Proc. Natl. Acad. Sci. USA 85, 5536-5540 Cited by (Google Scholar: 1451) (Web of Science: 1129).

   A widely used protocol for the agrobacterium mediated transformation of the model plant *Arabidopsis thaliana*. This technique was instrumental for the molecular dissection of plant biology and physiology through gene engineering.

10. De Block, M., Botterman, J., Vandewiele, M., Dockx, J., Thoen, C., Gossele, V., Roa Movva, N., Thompson, C., Van Montagu, M., Leemans, J. (1987) Engineering herbicide resistance in plants by expression of a detoxifying enzyme. EMBO J. 6, 2513-2518 Cited by (Google Scholar: 1119) (Web of Science: 576).

    Proof of concept of engineering herbicide tolerance in tobacco plants. Phosphinothricin (PPT) is a potent inhibitor of glutamine synthetase in plants and is used as a non-selective herbicide. The bar gene from Streptomyces hygroscopicus encodes a phosphinothricin acetyltransferase (PAT). The bar gene was placed under control of the 35S promoter of the cauliflower mosaic virus and transferred to plant cells using -mediated transformation.

11. Vaeck, M., Reynaerts, A., Höfte, H., Jansens, S., De Beuckeleer, M., Dean, C., Zabeau, M., Van Montagu, M., and Leemans, J. (1987). Transgenic plants protected from insect attack. Nature 328, 33-37. Cited by (Google Scholar: 1318) (Web of Science: 557).

    Proof of concept of engineering insect resistance in tobacco plants. The Gram-positive bacterium Bacillus thuringiensis produces proteins that are specifically toxic to a variety of insect species. Modified genes have been derived from bt2, a toxin gene cloned from one Bacillus strain. Transgenic tobacco plants expressing these genes synthesize insecticidal proteins that protect them from feeding damage by larvae of the tobacco hornworm.