Focus: Plant Biotechnology

Cover story
How are GM crops made?

Selective breeding has been used for hundreds of years to optimize crops. Since the mid-1980s it has been possible to directly modify the genes of crops in the lab and to specifically introduce selected properties. Biotech crops reached 170 million hectares in 2012. ChemViews magazine pictorially explains how genetically modified (GM) crops are made and shows their advantages and risks.

http://dx.doi.org/10.1002/chemv.201300052

Producing omega-3 fatty acids in oilseed crops

There is increasing consumer demand for the omega-3 fatty acids docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA) because of their well-recognized benefits for human health and the observation that current western diets are deficient in these important polyunsaturated fatty acids (PUFAs). This has led to the need for additional cost-effective and sustainable dietary sources of DHA and EPA beyond the traditional resource, oceanic fish. Recent advances in plant biotechnology have shown that DHA and EPA can be produced in vegetable oils using two approaches involving different sets of genes. These strategies, described in a Feature article in Lipid Technology, offer the potential for sustainable production of DHA and EPA in land-based oilseed crops.

http://doi.wiley.com/10.1002/lite.201300270

Nature-friendly GM crops

Genetically modified crop research has many benefits for plant attributes such as drought tolerance and nitrogen-use efficiency, yet is often subject to scepti-
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Improving Crop Resistance to Abiotic Stress
ISBN: 978-3-527-32840-6

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ISBN: 978-0-8138-0349-4

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ISBN: 978-0-470-66475-9
cism about the introduction of genetic combinations to nature that would not normally naturally exist. Public respect for nature has recently been the focus of new methods of breeding GM crops. Intragenesis and cisgenesis consist of genetically modifying crops with genes from the same species or similar species, which are already capable of sexual hybridization. A variety of GM crops have been modified according to these practises and some now have pending applications for deregulation from EU laws on GM crops. In this review from Plant Biotechnology Journal, the authors present a variety of recent intragenetic and cisgenetic developments, which may become significant for the public acceptance of future plant breeding.

http://doi.wiley.com/10.1002/biop.12055

SAPs as novel regulators of abiotic stress response in plants

Stress associated proteins (SAPs) are novel A20/AN1 zinc-finger proteins of plants showing phylogenetic relationship with their homologs in animals. They help protect crop-yield loss due to stress by acting as ubiquitin ligase, re- dox sensor, and regulator of gene expression. Also, they are known regulators of innate immunity in animals.

http://dx.doi.org/10.1002/biop.201200181

Faster than their prey: New insights into the rapid movements of active carnivorous plants traps

Carnivorous plants such as the Venus flytrap make use of mechanical tricks to speed up their traps. We review the interaction of plant organ dimension, movement speed and type of actuation as a biophysical principle, and discuss promising key aspects for future studies.

http://doi.wiley.com/10.1002/biop.201200175

Glassy state and cryopreservation of mint shoot tips

Vitrification refers to the physical process by which a liquid supercools to very low temperatures and finally solidifies into a metastable glass, without undergoing crystallization at a practical cooling rate. Thus, vitrification is an effective freeze-avoidance mechanism and living tissue cryopreservation is, in most cases, relying on it. As a glass is exceedingly viscous and stops all chemical reactions that require molecular diffusion, its formation leads to metabolic inactivity and stability over time. In this recent Biotechnology Progress article, Aline S. Teixeira and coworkers investigated the interaction of plant organ dimension, stress by acting as ubiquitin ligase, re-

http://onlinelibrary.wiley.com/doi/10.1002/biot.201200053/full#sec1-2

Getting published: The h-index

Due to limited resources, scientific funding bodies are always faced with the tough decision of which scientific/research projects to fund. To help make these decisions, many funding bodies have used the journal Impact Factor® (IF) as a surrogate marker for the scientific impact of a scientist's output. Of course, we know that the IF measures the average citations of a journal’s articles over a certain period of time, which means that the IF is not necessarily a direct reflection of the impact of individual papers. To combat these drawbacks, many funding bodies have now introduced a new factor to complement the IF in their assessment of a scientist’s output, i.e. the h-index.

The h-index, is named after its “inventor”, Jorge E. Hirsch. Simply put, it states that a researcher has an h-index of h, if he/she has h number of papers that have been cited at least h number of times. Graphically speaking, this looks like:

As a researcher competing for scientific funding, your h-index is critically important. How do you go about increasing your h-index?

The h-index boils down to citation and number of papers. It is not enough to be a one-hit wonder with one paper that has been cited over 100 times; it is also not enough to have 100 papers that have never been cited.

Citations: while self-citations have been used by some, at the end of the day, only the community can make a real impact on the number of citations that you have. It is therefore critically important to write and present your work in a way that it can be understood by your peers and ensure that it can be discovered by your peers (more on discoverability later).

Collaborations: in many scientific disciplines, collaborations are not only encouraged, but essential for success. Your number of scientific papers and therefore your h-index can greatly benefit by having productive collaborations.

As with all “measures”, such broad, sweeping numbers are prone to manipulation and gaming. While it is important to play the game, it is also important to remember that ultimately, research is about expanding our collective knowledge and only those who truly contribute, will have lasting success./jp

See also: “What is the Impact Factor®”

http://onlinelibrary.wiley.com/doi/10.1002/biot.201200053/full#sec1-2

All “Getting Published” articles

http://goo.gl/1xEZp
Investigate glassy state in cryopreserved plant material, mint shoot tips were submitted to the different stages of a frequently used cryopreservation protocol (droplet-vitrification) and evaluated for water content reduction and sucrose content, as determined by ion chromatography, frozen water fraction and glass transitions occurrence by differential scanning calorimetry, and investigated by low-temperature scanning electron microscopy, as a way to ascertain if their cellular content was vitrified. Results show how tissues at intermediate treatment steps develop ice crystals during liquid nitrogen cooling, while specimens whose treatment was completed become vitrified, with no evidence of ice formation.

Potato famine agent unmasked

*Phytophthora infestans*, the fungus responsible for potato late blight, triggered the Irish Great Famine in the late 1840s. A recent report published in *eLife* examined mitochondrial and nuclear DNA of this pathogen, isolated from historic dried leaf samples stored in herbaria across the world, by using shotgun sequencing. Potato crop failures that continued worldwide throughout the nineteenth century could be traced to a single strain, HERB-1. HERB-1 continued its global domination until the early twentieth century, when resistant potato varieties became available. Comparison with modern day samples suggests that a current dominant *P. infestans* strain, US-1, is not a direct descendant of HERB-1, but may share a common heritage. The HERB-1 strain is likely now extinct.

SMART method for sunflower crop improvement

Sunflowers are an important source of edible vegetable oil. An international consortium of researchers from India, France and Ireland has recently described a new approach to form and screen a sunflower mutant library to target specific plant traits. Published in *BMC Plant Biology*, chemical mutagenesis was combined with an endonuclease based mutation detection system (known as TILLING) to screen for mutations induced in two genes associated with fatty acid biosynthesis. This methodology can rapidly generate genetic diversity within a population, allowing key genetic information associated with specific useful traits in the sunflower species to be revealed. Mutation breeding faces fewer regulatory hurdles than transgenic crop development, and thus represents a cost effective method of creating new crop cultivars.

Endosperm development: Dynamic processes and cellular innovations underlying sibling altruism

Endosperms are products of fertilization that evolved to support and nourish their genetic twin sibling embryos. These nutritional stores prompted the domestication of cereals and are the focus of ongoing efforts for crop improvement and biotechnological innovations.

**Uddin and Kim**, *WIREs RNA* 2013

[http://onlinelibrary.wiley.com/doi/10.1002/wrna.1160/full](http://onlinelibrary.wiley.com/doi/10.1002/wrna.1160/full)

[http://dx.doi.org/10.7554/elife.00731](http://dx.doi.org/10.7554/elife.00731)

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**Becraft and Gutierrez-Marcos**, *WIREs Dev. Biol.* 2012

[http://onlinelibrary.wiley.com/doi/10.1002/wdev.31/full](http://onlinelibrary.wiley.com/doi/10.1002/wdev.31/full)

[http://dx.doi.org/10.1186/1471-2229-13-38](http://dx.doi.org/10.1186/1471-2229-13-38)

**Arabidopsis thaliana** as a model organism in systems biology

This review explains how systems biology is used in *Arabidopsis* to investigate the transcriptional networks regulating root development, the metabolic response to stress, and the genetic regulation of metabolic variability. Further investigation of plant systems will require continued improvement in metabolic technologies and novel computational methods for data visualization and modeling.

**Van Norman and Benfey**, *WIREs Syst. Biol. Med.* 2009

[http://onlinelibrary.wiley.com/doi/10.1002/wsbm.25/full](http://onlinelibrary.wiley.com/doi/10.1002/wsbm.25/full)

**Intercellular and systemic spread of RNA and RNAi in plants**

Intercellular trafficking of RNA has emerged as a novel mechanism of intercellular communication in plants for development, nutrient homeostasis, gene silencing, pathogen defense, and many other physiological processes. This review discusses current progress in RNA trafficking research, as well as diverse plant regulatory mechanisms of cell-to-cell and systemic long-distance transport of mRNAs, viral RNAs, and small RNAs.

**Uddin and Kim**, *WIREs RNA* 2013

[http://onlinelibrary.wiley.com/doi/10.1002/wrna.1160/full](http://onlinelibrary.wiley.com/doi/10.1002/wrna.1160/full)

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Cloning Norway spruce stands – timber and energy biomass potential

In this study featured in *Global Change Biology Bioenergy*, the authors used ecosystem model simulations to study the timber and energy biomass potential offered by intensively managed cloned Norway spruce stands. Specifically, they analyse how the use of cloned trees compared with non-cloned trees, together with thinning, nitrogen (N) fertilisation and rotation length (from 60 to 100 years), affects the annual mean production of timber and energy biomass and its economic profitability. The study concludes that the use of cloned trees, together with intensive management, could potentially be highly beneficial for the cost-efficient and sustainable production of timber and energy biomass in an integrated way.

http://dx.doi.org/10.1111/gcbb.12002

Isolation and characterization of lignin-degrading bacteria from rainforest soils

Bacterial strains C6 (*Bacillus pumilus*) and B7 (*Bacillus atrophaeus*) isolated from soils of a biodiversity-rich rainforest in Peru have been characterized. Strains B7 and C6 are shown to degrade Kraft lignin, the lignin model dimer guaiacylglycerol-b-guaiacyl ether, and poplar biomass. In the June 2013 issue of *Biotechnology and Bioengineering*, these findings by Kenneth F. Reardon and coworkers provide important evidence that bacterial enzymes can degrade and/or modify lignin and have great potential of biological pretreatment process biomass to enhance the release of fermentable sugars from lignocellulose.

http://dx.doi.org/10.1002/bit.24833

Vitamin C in your daily (corn) bread

The importance of vitamin C in our diet is a well-established fact these days. A lack of vitamin C leads to many health complications, the most obvious being scurvy, which plagued long distance voyagers prior to the discovery of vitamin C and establishing a causative link between vitamin C and scurvy. While fruits and vegetables are rich sources of vitamin C, stable crops on the other hand, do not provide high levels of vitamin C. Therefore, by understanding the regulation of vitamin C synthesis and accumulation in stable crops, a significant contribution can be made in improving the nutritional status of a large portion of the population. In this latest article in *Biotechnology Journal* by Capell and colleagues, the author make in-roads to understanding vitamin C synthesis and accumulation in maize by examining three maize strains and one transgenic strain. The authors demonstrate significant genotype-dependent variations in vitamin C synthesis.

http://doi.wiley.com/10.1002/biot.201300064

AFOB news

Join AFOB and receive complimentary access to BTJ

The Asian Federation of Biotechnology (AFOB) is a not-for-profit organization with the goal of fostering collaborations and exchange of ideas, skills, knowledge, and human resources between academia and research in the Asian region.

Recently, the AFOB appointed *Biotechnology Journal* (BTJ) as its official journal. To celebrate this collaboration, BTJ is pleased to offer all members of the AFOB to a one-year complimentary access to the journal. Sign-up for the free access will continue till the end of 2013, so join the AFOB now (membership is free) to take advantage of this unique opportunity.

www.afob.org/

Asian Congress of Biotechnology

The Asian Congress on Biotechnology (ACB) is a biennial event organized by the AFOB. The conference series is a continuation of the well-established Asia Pacific Biochemical Engineering Conference (APBioChEC).

The second ACB, ACB2013, will be held in New Delhi, India, December 15-19, 2013 (Sun-Thur). Early bird registration deadline: August 15, 2013.

www.acb2013.in
Phenolic composition of virgin olive oils from narrow hedgerow olive orchards

Narrow hedgerow is a new very high density (>1500 trees/ha) olive planting system associated to overhead vineyard harvesters that is increasingly used as it reduces drastically both labor and time needed to harvest the crop. This study focuses on the comparison of the content of phenolic compounds in olive oils originated from narrow hedgerow system and intensive system. The results can be used to determine the best time for harvesting the new olive cultivar Sikitita, recently selected for narrow hedgerow system, in order to obtain an olive oil with high phenolic content.

http://doi.wiley.com/10.1002/ejlt.201300001

Pinolenic acid as a new source of phyto-PUFA

Pinolenic acid (PLA, all-cis-5,9,12-18:3) is an interesting plant-based polyunsaturated fatty acid of which little is known. The major source of PLA is pine nut oil. PLA has distinctive health benefits such as LDL/VLDL cholesterol lowering potential and displays an appetite suppressing effect. Enrichment of PLA can be carried out by physical procedures or by enzymatic reactions with lipases such as Candida antarctica lipase B and Candida rugosa lipase.

Paul Goyette, CC-BY-SA-2.0

http://doi.wiley.com/10.1002/lite.201300278

BiotecEvents

Modelling course

What: Biosystems engineering course – “Bioreactors and Cell Factories”
When: September 8-13, 2013
Where: Braunwald, Switzerland
Interested in mathematical modelling and simulation? Attend this annual workshop that has been training the next-generation leaders in the field since 1981.

www.uni-saarland.de/~pb16eh/

If you cannot attend in person, this book written by the instructors of the workshop may be useful:

Title: Biological Reaction Engineering
Authors: Irving J. Dunn, Elmar Heinzle, John Ingham and Jiri E. Prenosil
ISBN: 9783527307593

http://onlinelibrary.wiley.com/book/10.1002/3527603050

IUBMB events

What: 14th IUBMB Conference: “Host-Microbe Interactions”
When: November 17 – 20, 2013
Where: Marrakech, Morocco

www.iubmb-2013.org/

ESBES events

What: Hybrid Modeling Summer School
When: September 4-5, 2013
Where: Lisbon, Portugal

http://tanyrd.com/2013/hybrid-modeling-summer-school/

Biochemical Engineering Young Investigator Award

Mathew P. DeLisa, Professor at the Cornell University – School of Chemical and Biomolecular Engineering, is the recipient of the 2013 Biochemical Engineering Journal Young Investigator Award.

The award is organized by the Biochemical Engineering Journal in cooperation with the ECI Biochemical and Molecular Engineering Conferences Steering Committee. This annual award recognizes outstanding excellence in research and practice contributed to the field of biochemical engineering by a young community member.

Prof. DeLisa’s research is focused on cellular protein biogenesis: one of his recent publications include that in Biotechnology Journal, in which DeLisa and colleagues demonstrated that the ribosomal exit tunnel proteins are key for the production of complex recombinant proteins in bacteria (Biotechnol. J., 2012, 7, 354-360).

Congratulations to Prof. DeLisa for this well-deserved recognition of his achievements and contributions to advancing biochemical engineering.

http://go2.gl/VukEF

http://doi.wiley.com/10.1002/biot.201100198
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2013. Volume 2, 12 issues.
Print ISSN: 2192-2640 • Online ISSN: 2192-2659

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Our mission for the Journal of Biophotonics is to connect the various scientists who try to understand basic biological processes using light as a diagnostic and therapeutic tool. To create a platform where the physicist communicates with the biologist and where the clinical practitioner learns about the latest tools he can use for diagnosis of diseases – this is our intention with this journal. You are cordially invited to join us in this exciting field of cross disciplinary research.

Jürgen Popp
Jena, GER
Editor-in-Chief

"Our mission for the Journal of Biophotonics is to connect the various scientists who try to understand basic biological processes using light as a diagnostic and therapeutic tool. To create a platform where the physicist communicates with the biologist and where the clinical practitioner learns about the latest tools he can use for diagnosis of diseases – this is our intention with this journal. You are cordially invited to join us in this exciting field of cross disciplinary research."

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