Plant Cell Rep (2011) 30:677–679
DOI 10.1007/s00299-011-1063-5

EDITORIAL

Plant biotechnology in support of the Millennium Goals II

Michael E. Horn · Günther Hahne · Ralf Reski

Published online: 27 March 2011

As was described in the initial editorial in this two-part series (Hahne et al. 2011), in the year 2000 189 heads of state, within the auspices of the United Nations, established eight Millennium Goals to be accomplished by 2015:

1. Eradicate extreme poverty and hunger.
2. Achieve universal primary education.
3. Promote gender equality and empower women.
4. Reduce child mortality.
5. Improve maternal health.
6. Combat HIV/AIDS, malaria, and other diseases.
7. Ensure environmental stability.
8. Development a global partnership for development.

While considerable progress toward these goals has been made, there is little question there remains a tremendous challenge in the quest to eliminate hunger throughout much of the developing world. Even in rapidly growing countries such as China and India, there remain large segments of their populations who still live on only $2 per day or less. In 2010, there was an estimated 925 million people defined as being hungry with ~578 million, or 62%, living in the Asian and Pacific region (http://www.worldhunger.org/articles/). But it has now been reported by FAO that the number of hungry/malnourished people has increased to over 1 billion (ftp://ftp.fao.org/docrep/fao/012/i0876e/i0876e02.pdf). At the same time, we have observed stunning increases in the cost of many basic food components, particularly wheat, corn, rice, and soybeans as well as cotton. While the increases in food prices has little impact in highly developed countries where the basic food component costs are small, in developing countries the situation is very different. When half of a person's budget is allocated to food and that food price goes up 30–40%, that person must make very difficult choices. Hence, despite the efforts of governments and many NGOs, hunger/malnutrition has been actually increasing rather than decreasing.

It is thought that the world produces enough food for every man, woman, and child to have 2,720 calories each day. There are distribution problems since most of the surplus food is produced in locations very far away from the areas that need food assistance. A large proportion of the food produced each year is wasted through spoilage, insects, and other problems. The annual climate problems such as drought (as recently witnessed in Ukraine) and flooding (cf. recent events in Pakistan and Australia) can reduce food production by a significant amount. Ever since the landmark paper by Pelletier et al. (1995), we know the best way to reducing child mortality is by reducing malnutrition in the population. It is the purpose of this special issue to provide a synopsis of the research being conducted in plant biotechnology today which will hopefully provide information for increasing crop yields, reducing post-harvest problems and thereby help reduce malnutrition and help achieve some of the Millennium Goals listed above.

In addition to the various aspects of crop yields, we are pleased to bring the reader review and original articles dealing with other aspects of plant biotechnology including but not limited to molecular pharming, secondary product production, horticulture, and technology improvements.

M. E. Horn (✉)
Cibus US LLC, San Diego, CA, USA
e-mail: mhornpcr@gmail.com

G. Hahne
IRD, Marseille, France
e-mail: plantcellreports@ghahne.fastmail.fm

R. Reski
Faculty of Biology, University of Freiburg, Schaenzlestr. 1, 79104 Freiburg, Germany
e-mail: ralf.reski@biologie.uni-freiburg.de

This issue of *Plant Cell Reports*, part 2 of the series, continues with 13 reviews, one opinion, and seven original research papers that were submitted in response to a call for papers issued in the fall of 2010 and subjected to a rigorous review process. The editors were very appreciative at the number of excellent submissions as much as of the range and diversity of the subject matter. Of particular note is the review by Komatsu and colleagues on the use of proteomics to investigate stress-induced proteins in crop plants that should be of interest to a great many readers (Afroz et al. 2011). Also of interest to a broad swath of readers is the review on enhancer–promoter interference in transgenic plants (Singer et al. 2011). There is an opinion paper on the opportunities and constraints with regard to biotech papaya in certain countries (Fermin and Tennant 2011).

A timely review by Bull et al. (2011) discusses the biotechnology of cassava and the transfer of that technology to Africa and illustrates the potential and the limits of this approach. Quite outside of the realm of increasing crop yields but still with the hope of greatly improving human health and well-being in developing countries is a review of progress in plant-made edible vaccines (Penney et al. 2011). A potentially revolutionary technology, the use of artificial chromosomes for improving crops, is reviewed by Dhar et al. (2011).There is also a review on androgenesis in difficult Solanaceous species by Seguí-Simarro et al. (2011). Salt and drought stress is conferred in hot pepper in an original research article by Choi et al. (2011). Stress tolerance is also the subject of a paper by Ghanem et al. (2011) who seeks to engineer the hormonal balance in root stocks. Problems in the vitally important Mediterranean citrus industry are addressed by Dambier et al. (2011) who use somatic hybridization while Portal et al. (2011) examine banana-fungal interactions using sequence tagging. Finally, there is an exciting review article on the use of gametic embryogenesis and haploid technology for breeding purposes by Germanà (2011).

In the area of secondary products, this issue has review articles discussing artemisinin production (Lui et al. 2011) as well as capsaicinoid biosynthesis (Aza-González et al. 2011). An original research paper by Sato et al. (2011) describes how somaclonal variation resulted in higher expression of a flavonoid due to transposon excision from a promoter region.

There are also several crop-specific reviews and original articles. Reviews are presented on the genetic improvement in radish (Curtis 2011) as well as in pomegranate (Naik and Chand 2011). Original research papers discuss the use of sonication-assisted *Agrobacterium rhizogenes* transformation for bioactive metabolite formation (Georgiev et al. 2011), and the use of wild type *A. rhizogenes* to stimulate saponin production (Majumdar et al. 2011) is included in this volume. In the area of rice improvement through plant biotechnology, there is an original research article by Gao et al. (2011) describing a purple sheath somaclonal mutant. As for Mulberry improvement, we have included a review by Khurana and Checker (2011).

We trust that all readers will find this collection of articles to be interesting and thought provoking. More special issues will be forthcoming in *Plant Cell Reports* in the months and years ahead. Your suggestions for its improvement are highly welcome, as are proposals for topics on which you would like to see special issues of *Plant Cell Reports*.

References

Afroz A, Ali GM, Mir A, Komatsu S (2011) Application of proteomics to investigate stress-induced proteins for improvement in crop protection. Plant Cell Rep 30 (this issue). doi:10.1007/s00299-010-0982-x

Aza-González C, Núñez-Palenius HG, Ochoa-Alejo N (2011) Molecular biology of capsaicinoid biosynthesis in chili pepper (*Capsicum* spp.). Plant Cell Rep 30 (this issue). doi:10.1007/s00299-010-0968-8

Bull SE, Ndunguru J, Gruissem W, Beeching JR, Vanderschuren H (2011) Cassava: constraints to production and the transfer of biotechnology to African laboratories. Plant Cell Rep 30 (this issue). doi:10.1007/s00299-010-0986-6

Choi JY, Seo YS, Kim SJ, Kim WT, Shin JS (2011) Constitutive expression of *CaXTH3*, a hot pepper xyloglucan endotransglucosylase/hydrolase, enhanced tolerance to salt and drought stresses without phenotypic defects in tomato plants (*Solanum lycopersicum* cv. Dotaerang). Plant Cell Rep 30 (this issue). doi:10.1007/s00299-010-0989-3

Curtis IS (2011) Genetic engineering of radish: current achievements and future goals. Plant Cell Rep 30 (this issue). doi:10.1007/s00299-010-0978-6

Dambier D, Benyahia H, Pensabene-Bellavia G, Aka Kaçar Y, Froelicher Y, Belfalah Z, Lhou B, Handaji N, Printz B, Morillon R, Yesiloglu T, Navarro L, Ollitrault P (2011) Somatic hybridization for *Citrus* rootstock breeding: an effective tool to solve some important issues of the Mediterranean citrus industry. Plant Cell Rep 30 (this issue). doi:10.1007/s00299-010-1000-z

Dhar MK, Kaul S, Kour J (2011) Towards the development of better crops by genetic transformation using engineered plant chromosomes. Plant Cell Rep 30 (this issue). doi:10.1007/s00299-011-1001-6

Fermin G, Tennant P (2011) Opportunities and constraints to biotechnological applications in the Caribbean: transgenic papayas in Jamaica and Venezuela. Plant Cell Rep 30 (this issue). doi:10.1007/s00299-010-0988-4

Gao D, He B, Zhou Y, Sun L (2011) Genetic and molecular analysis of a purple sheath somaclonal mutant in *japonica* rice. Plant Cell Rep 30 (this issue). doi:10.1007/s00299-011-1004-3

Georgiev MI, Ludwig-Müller J, Alipieva K, Lippert A (2011) Sonication-assisted *Agrobacterium rhizogenes*-mediated transformation of *Verbascum xanthophoeniceum* Griseb. for bioactive metabolite accumulation. Plant Cell Rep 30 (this issue). doi:10.1007/s00299-010-0981-y

Germanà MA (2011) Gametic embryogenesis and haploid technology as valuable support to plant breeding. Plant Cell Rep 30 (this issue). doi:10.1007/s00299-011-1061-7

Ghanem ME, Hichri I, Smigocki AC, Albacete A, Fauconnier M-L, Diatloff E, Martinez-Andujar C, Lutts S, Dodd IC, Pérez-Alfocea F (2011) Root-targeted biotechnology to mediate hormonal signaling and improve crop stress tolerance. Plant Cell Rep 30 (this issue). doi:10.1007/s00299-011-1005-2

Hahne G, Horn M, Reski R (2011) Plant biotechnology in support of the Millennium Goals. Plant Cell Rep 30:245–247

Khurana P, Checker VG (2011) The advent of genomics in Mulberry and perspectives for productivity enhancement. Plant Cell Rep 30 (this issue). doi:10.1007/s00299-011-1059-1

Lui B, Wang H, Du Z, Li G, Ye H (2011) Metabolic engineering of artemisinin biosynthesis in *Artemisia annua* L. Plant Cell Rep 30 (this issue). doi:10.1007/s00299-010-0967-9

Majumdar S, Garai S, Jha S (2011) Genetic transformation of *Bacopa monniera* by wild type strains of *Agrobacterium rhizogenes* stimulates production of bacopa saponins in transformed calli and plants. Plant Cell Rep 30 (this issue). doi:10.1007/s00299-011-1035-9

Naik SK, Chand PK (2011) Tissue culture-mediated biotechnological intervention in pomegranate: a review. Plant Cell Rep 30 (this issue). doi:10.1007/s00299-010-0969-7

Pelletier DL, Frongillo EA Jr, Schroeder D, Habicht JP (1995) The effects of malnutrition on child mortality in developing countries. Bull World Health Organ 73:443–448

Penney CA, Thomas DR, Deen SS, Walmsley AM (2011) Plant-made vaccines in support of the Millennium Development Goals. Plant Cell Rep 30 (this issue). doi:10.1007/s00299-010-0995-5

Portal O, Izquierdo Y, De Vleesschauwer D, Sánchez-Rodríguez A, Mendoza-Rodríguez M, Acosta-Suárez M, Ocaña B, Jiménez E, Höfte M (2011) Analysis of expressed sequence tags derived from a compatible *Mycosphaerella fijiensis*-banana interaction. Plant Cell Rep 30 (this issue). doi:10.1007/s00299-011-1008-z

Sato M, Kawabe T, Hosokawa M, Tatsuzawa F, Doi M (2011) Tissue culture-induced flower-color changes in *Saintpaulia* caused by excision of the transposon inserted in the *flavonoid 3′,5′ hydroxylase* (*F3′5′H*) promoter. Plant Cell Rep 30 (this issue). doi:10.1007/s00299-011-1016-z

Seguí-Simarro JM, Corral-Martínez P, Parra-Vega V, González-García B (2011) Androgenesis in recalcitrant Solanaceous crops. Plant Cell Rep 30 (this issue). doi:10.1007/s00299-010-0984-8

Singer SD, Cox KD, Liu Z (2011) Enhancer-promoter interference and its prevention in transgenic plants. Plant Cell Rep 30 (this issue). doi:10.1007/s00299-010-0977-7