PlantEd

COST Action CA18111

ISBN: 978-88-8080-475-8
DOI: https://doi.org/10.48257/ACLE-001

2nd PlantEd Conference
Plant genome editing: the wide range of applications

20-22 September 2021

Lecce, Italy

BOOK of ABSTRACTS

DiSBA

UNIVERSITÀ DEL SALENTO

PlantEd
COST Action CA18111

2nd PlantEd Conference

Plant genome editing:

the wide range of applications

Organized by:

Department of Biology, Agriculture and Food Sciences, National Research Council, Italy

University of Salento, Italy

Published by

Institute of Sciences of Food Production-National Research Council

(ISPA-CNR)

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DOI: https://doi.org/10.48257/ACLE-001

COST Action CA18111 (PlantEd)
"GENOME EDITING IN PLANTS - A TECHNOLOGY WITH TRANSFORMATIVE POTENTIAL"

2nd PlantEd Conference

Plant genome editing: the wide range of applications

20-22 September, 2021

Lecce, Italy

The 2nd conference of PlantEd (COST Action 18111) will take place over three days, with open scientific sessions dedicated to genome editing technology in plants, followed by PlantEd Working Group (WG) meetings as well as a Management Committee (MC) meeting. With PlantEd being a network for research on plant genome editing across Europe and beyond, this conference is an excellent platform for dissemination, discussions and connections, and to stay updated on the latest research and innovation forefront. The conference will be carried out as a hybrid event, with physical presence of a limited number of participants as well as live streaming, through the Gotowebinar platform). The conference will be promoted by the scientific journal Plants (IF 2.76).
The conference will host sessions on the application of genome editing in various types of economically important plants (cereals, oilcrops, roots and tubers, legumes, fruits and vegetables, trees, algae), as well as present the latest technological advancements for genome editing in plants. We will also host joint sessions with other relevant COST Actions to explore mutually beneficial interactions.
This conference takes place towards the end of the second grant period, which marks the half time of the duration of the Action. The outcome of the conference, including the WG meetings and the MC meeting, will help shaping the activities of PlantEd over the second half. The conference will be followed immediately by a WG2 Training School on impact.

Dear Conference participant,

I am very much looking forward to this conference, which for me will be the first on-site academic event in more than a year and half. The previous PlantEd conference took place in Novi Sad, Serbia, on 5-7 November 2019. Since then we have experienced very challenging times indeed with the global Covid-19 pandemic. The world of plant genome editing has nevertheless continued to develop fast. To mention but a few advances: the Cas protein PAM range and specificity has improved[1], carbon-based nanoparticles promise a more efficient delivery into cells[2], editing through de novo induction of meristems has bypassed the need for extended tissue culture[3], prime editing has been applied in cereals[4], multiplexing has allowed six genes to be edited simultaneously[5], and CRISPR/Cas is being applied widely for epigenetic editing[6]. In addition, companies are getting started to facilitate gene editing through outsourcing[7], and the Nobel Prize of chemistry was – finally! – awarded in 2020 to two outstanding women who have paved the way for the field of genome editing as we know it today. On the regulatory front, it is noteworthy that the European Commission has now opened up for discussion on how to change the EU GMO law.[8] The implications of this for plant genome editing research and innovation in Europe remain to be seen, but hopefully it means a step towards a regulatory system that enables safe and sustainable applications of genome editing for an environmentally-friendly plant-based production that sustain humanity´s needs.

I am looking forward to meet you in Lecce!

Yours sincerely,

Dennis Eriksson

Action Chair PlantEd

[1] Chatterjee P et al (2020). An engineered ScCas9 with broad PAM range and high specificity and activity. Nature Biotechnology, 38: 1154–1158.

[2] Lv Z et al (2020). Nanoparticle-mediated gene transformation strategies for plant genetic engineering. The Plant Journal, 104(4): 880-891.

[3] Maher MF et al (2020). Plant gene editing through de novo induction of meristems. Nature Biotechnology, 38: 84–89.

[4] Lin Q et al (2020). Prime genome editing in rice and wheat. Nature Biotechnology, 38: 582–585.

[5] Bollier N et al (2021). Efficient simultaneous mutagenesis of multiple genes in specific plant tissues by multiplex CRISPR. Plant Biotechnology Journal, 19: 651-653.

[6] Nakamura M et al (2021). CRISPR technologies for precise epigenome editing. Nature Cell Biology, 23: 11-22.

[7] https://soledits.com/

[8] EC study on new genomic techniques, https://ec.europa.eu/food/plants/genetically-modified-organisms/new-techniques-biotechnology/ec-study-new-genomic-techniques_en

PROGRAMME 2nd PlantEd Conference

Monday 20 Sept

08:30-09:10	**REGISTRATION**
09:10-09:30	***OPENING of the CONFERENCE***
09:30-12:00	**Genome editing in cereals** ***Moderator: Roberto Defez, IBBR-CNR, Italy***
09:30-10:00	*Raffaella Battaglia, CREA, Italy* **Modulating yield components in barley**
10:00-10:20	*Goetz Hensel, Heinrich-Heine-University, Germany* Precise gene editing of barley using ribonucleoprotein complexes
10:20-10:40	*Pouneh Pouramini, Leibniz Institute of Plant Genetics and Crop Plant Research, Germany* Targeted knock out of barley endosperm-specific storage proteins as a prerequisite for molecular farming purposes
10:40-11:20	*Coffee break- Posters display*
11:20-11:40	*Stefania Masci, University of Tuscia, Italy* CRISPR-Cas9 genome editing for the development of wheat lines with improved nutritional properties
11:40-12:00	*Sadiye Hayta, John Innes Centre, UK* Extending genome editing into elite wheat cultivars by deploying morphological genes
12:00-13:00	*Lunch*
13:00-15:40	**Genome editing in fruits and vegetables** ***Moderator: Angelo Santino, ISPA-CNR, Italy***
13:00-13:30	*Cathie Martin, John Innes Centre, UK* **Engineering vitamin content of tomato by genome editing**
13:30-13:50	*Aurelia Scarano, CNR-ISPA, Italy* CRISPR/Cas9-mediated genome editing on *SlDET1* gene for the nutritional improvement of tomato

13:50-14:10	*Musa Kavas, Ondokuz Mayıs University, Turkey* Generation of male-sterile tomato lines with the CRISPR/Cas9 system
14:10-14:30	*Alessandro Nicolia, CREA-OF, Italy* CRISPR/Cas9-mediated mutagenesis as a strategy to develop resistant tomato plants against Orobanche
14:30-15:00	*Coffee break*
15:00-15:20	*Paola Punzo, CREA-OF, Italy* CRISPR/Cas9 editing of proline metabolism and SOS pathway genes for improving abiotic stress tolerance in tomato
15:20-15:40	*Loredana Moffa, CREA-VE, Italy* Potential of New Plant Breeding Techniques for grapevine breeding
16:00-18:00	**PlantEd Working Groups meetings (WG1-WG5)**
19:00-20:30	*WELCOME COCKTAIL*

Tuesday 21 Sept

08:45-10:25	**Genome editing in plants- the latest technological advancements** ***Moderator: Isabel Mafra, University of Porto, Portugal***
08:45-09:05	*William de Martines, Plant Breeding, Wageningen University, Netherlands* New approaches to gene targeting in plants by exploiting the unique characteristics of CRISPR-Cas12a
09:05-09:25	*Fabio D'Orso, CREA-GB, Italy* Effective CRISPR-mediated knockout mutations in plants require translations reinitiation avoidance
09:25-9:45	*Ellen Slaman, Wageningen University, Netherlands* Applying high-throughput technology to identify CRISPR-Cas9 induced off-target mutations in tomato
09:45-10:05	*Isabel Mafra, REQUIMTE-LAQV, University of Porto, Portugal* Are there available tools to trace genome-edited crops in foods?

10:05-10:25	*Agnes E. Ricroch*, *IDEST, Paris-Saclay University, France* Next biotechnological plants for addressing global challenges: the contribution of transgenesis and New Breeding Techniques
10:25-11:15	*Coffee break – Poster Session*
11:15-12:00	**Joint session with COST Action EPI-CATCH** ***Moderator: Dennis Eriksson, SLU, Sweden***
11:15-11:30	*Federico Martinelli, University of Florence, Italy* Transgenerational effects of chromium stress in *Arabidopsis thaliana*
11:30-11:45	*Michal Lieberman-Lazarovich*, *Agricultural Research Organization, Israel* Epigenetics of heat stress response in tomato
11:45-12:00	*Ueli Grossniklaus, University of Zurich, Switzerland* Standing epigenetic variation is subject to selection and contributes to relevant plant phenotypes
12:00-13:00	*Lunch*
13:00-15:20	**Genome editing in roots and tubers** ***Moderator: Guy Smagghe, Ghent University, Belgium***
13:00-13:20	*Erik Andreasson, Swedish University of Agricultural Sciences, Sweden* Mutations in susceptibility genes through CRISPR/Cas9 genome editing confer increased pathogen resistance in potato
13:20-13:40	*Csaba Eva, Centre for Agricultural Research, Hungary* Edition of potato for reduced PPO activity confers resistance to *Ralstonia solanacearum*
13:40-14:00	*Jeny Jose, Centre for Agricultural Research, Hungary* Molecular and metabolomics analysis of resistant potato varieties as a way forward to generate resistance to *Ralstonia solanacearum*
14:00-14:20	*Mario Tavazza, ENEA, Italy* CRISPR-Cas9 targeting of the *eIF4e-1* gene induces resistance to *Potato Virus Y* in *Solanum tuberosum* L. cv. Desirée
14:20-14:40	*Coffee break*
14:40-15:00	*Priscilla Olayide*, *Swedish University of Agricultural Sciences, Sweden* Identification of suitable targets for gene editing mediated crop improvement: the example of CRISPR/Cas9 directed gene editing in cassava for increased

	β-carotene accumulation
15:00-15:20	*Guy Smagghe*, *Ghent University, Belgium* First report on CRISPR/Cas9-targeted mutagenesis in the Colorado potato beetle, *Leptinotarsa decemlineata*
15:30-17:30	**PlantEd 3rd Management Committee meeting**
19:00-23:00	*SOCIAL DINNER*

Wednesday 22 Sept

08:45-10:55	**Genome editing in oilcrops, algae, trees and other plants** ***Moderator: Tobias Brügmann, Thünen Institute of Forest Genetics, Germany***
08:45-09:15	*Li-Hua Zhu, Swedish University of Agriculture Sciences, Sweden* **CRISPR-Cas9 editing in rapeseed**
09:15-09:35	*Tobias Brügmann*, *Thünen Institute of Forest Genetics, Germany* Establishment of genome editing techniques in trees
09:35-09:55	*Vladislava Galovic, University of Novi Sad, Serbia* Gene editing in poplar using CRISPR/Cas to improve tolerance to *Lonsdalea populi* infection
09:55-10:15	*Hilde-Gunn Opsahl-Sorteberg, Norwegian University of Life Sciences, Norway* Navigating possible seaweed industrial development by crucial genomic tools
10:15-10:35	*Charlotte De Bruyn, ILVO, Belgium* Identification of bitterness related biosynthesis genes in *Cichorium* using CRISPR/Cas9 genome editing
10:35:10:55	*Matthias Fladung, Thünen Institute of Forest Genetics, Germany* Targeted CRISPR/Cas9-based knock-out of the rice orthologs *TILLER ANGLE CONTROL1 (TAC1)* in poplar induced erect leaf habit and shoot growth
10:55-11:20	*Coffee break*

11:20-12:30	**STSM session** ***Moderator: Dennis Eriksson, SLU, Sweden***
11:20-11:30	*Justyna Boniecka, Nicolaus Copernicus University, Poland* Targeted mutagenesis in oilseed rape (*Brassica napus* L.) protoplasts using CRISPR/Cas
11:30-11:40	*Andreja Škiljaica, University of Zagreb, Croatia* Gene editing of *Arabisopsis thaliana* cytosolic/nuclear subclass of Hsp70
11:40-11:50	*Kubilay Yıldırım, Ondokuz Mayıs University, Turkey* *Agrobacterium* mediated CRISPR/Cas9 transformative potential to modify abiotic stresses in poplar
11:50-12:00	*Dejan Stojkovic*, *University of Belgrade, Serbia.* First steps towards bioactivity guided gene editing in chicory for the higher production of targeted sesquiterpene lactones: CHIC project
12:00-12:10	*Melekşen Akın, Igdir University, Turkey* Gene editing in celery: Short Time Scientific Mission at ILVO
12:10-12:20	*André Rosado, Aberystwyth University, UK* Overview of biosafety regulations to support the future regulatory status of precision breeding products in some non-EU countries
12:20-12:30	*Juan Antonio Vives-Vallés*, *University of the Balearic Islands, Spain* Plant Breeders' Rights in the light of the NPBT
12:30-12:35	**Presentation by EU-SAGE**
12:35-12:45	**POSTER PRIZE ceremony**
12:45-13:00	***OFFICIAL CLOSING OF THE CONFERENCE***
13:00-14:00	*Lunch*

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Genome editing of wheat - challenges and prospects for tackling changing environment

Ankica Kondić-Špika[1], Sanja Mikić[1], Milan Mirosavljević[1], Verica Takač[1], Dragana Miladinović[1], and Ana Marjanović Jeromela[1]

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Developing wheat able to sustainably produce high yields when grown under biotic/abiotic stresses is an important goal, in order to obtain food security in the face of ever-increasing human population and unpredictable global climatic conditions. However, random mutagenesis or genetic recombination as conventional ways for wheat improvement, are time-consuming and cannot keep pace with increasing food demands. Targeted genome editing (GE) technologies, like zinc-finger nucleases, transcription activator-like effector nuclease, and clustered regularly interspaced short palindromic repeats (CRISPR)/(CRISPR)-associated protein 9 (Cas9)) have been successfully used in editing wheat genome to get heritable variations for creating diversity and precision breeding. The tetraploid durum wheat (*Triticum turgidum* ssp. durum L.) and the hexaploid bread wheat (*Triticum aestivum* L.) are the most widely cultivated types, both with large genomes, developed as a consequence of ancient hybridization events between ancestral progenitors. The highly conserved gene sequence and structure of homoeologs among subgenomes in wheat often permits their simultaneous targeting using CRISPR-Cas9 with single or paired single guide RNA (sgRNA). Since its first successful deployment in wheat, CRISPR-Cas9 technology has been applied to a wide array of gene targets of agronomical and scientific importance, such as α-gliadin genes to lower gluten grain content, *TaGW2* to increase grain weight, *TaZIP4-B2* to understand meiotic homologous crossover, *TaQsd1* to reduce preharvest sprouting, *TaMTL* and *CENH3* for haploid plant induction etc. In the future, genes important for abiotic stress tolerance of wheat should be also targeted by GE technologies. During the last decade, identification of sources for abiotic stress tolerance in the IFVCNS wheat collection was performed under different projects, complemented with molecular analyses for identification of candidate genes of importance for wide adaptation of wheat to changeable environments. The final aim is the exploitation of IFVCNS wheat collections and the newest breeding technologies, such as genome editing, epigenetic tools, genome selection etc. for creation of highly productive resilient wheat varieties, as well as ideotypes specific for certain agro-ecological conditions.

Acknowledgements: This work is part of the project supported by Ministry of Education, Science and Technological Development of Republic of Serbia, grant number 451-03-9/2021-14/200032, and COST Action CA18111.