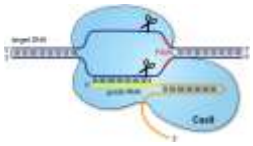
Genetic engineering to superior crop development: CRISPR-mediated genome edition – A CBAB/CABBIO initiative

About CRISPR/Cas9



The CRISPR/Cas9 genome editing system is one of the most powerful techniques in modern biotechnology. The programmable nuclease machinery was first described in bacteria as part of anti-viral defense and has been explored as a new tool of genetic engineering since 2011. The system is composed by target-complementary sgRNA associated with the Cas9 nuclease, capable to generate a DNA cleavage at specific sequences in eukaryotic genome. The success of this methodology concentrates in two aspects: the directionality of sgRNA to specific DNA sequences and the eukaryotic DNA-repair machinery, which recombine the broken DNA creating sequence indels or sequence modification through homologous recombination. These DNA-repair mechanisms triggered by Cas9 DNA-cleavage rise up the possibility to entire genes or gene promoter edition, disrupting their translational frame, correcting some important mutations or inserting some regulatory sequence. Recent advances in molecular biology exceeded the DNA-repair based edition applying mutant Cas9, called dCas9, which don't encompass the nuclease domain and, in association of transcriptional activators or repressors, can regulate gene activity transcriptionally. The different genome-edition approaches can be applied to many organism's characteristics improvement, especially in plants. The superior plant prospection by CRISPR/Cas9 genome edition overmatches agricultural challenges related to abiotic and biotic stress, displaying a new way to improve plant adaptability and yield. The course "Genetic engineering to superior crop development: CRISPR/Cas9-mediated genome edition" offers a complete overview to plant CRISPR/Cas9 system design, since sgRNA-vector selection until plant genetic transformation.

Speakers/Organization Committee

Dr. Maria Fatima Grossi de Sa
Embrapa Cenargen/UCB

Dr. Alexandre Nepomuceno
Embrapa Soybean

Dr. Eduardo Romano
Embrapa Cenargen

Dr. Elíbio L. Rech Filho
Embrapa Cenargen

Dr. Hugo B. C. Molinari
Embrapa Agroenergy

Dr. Carolina Morgante
Embrapa Semiarid

Dr. Sergio Enrique Feingold
INTA-AR

Dr. Marcos Basso
Embrapa Cenargen

Dr. Cíntia M. Coelho
UnB

Dr. Isabela Lourenço Tessutti
Embrapa Cenargen

Dr. Bruno Paes de Melo
Embrapa Cenargen
UFV

Dr. Fabrício Arraes
Embrapa Cenargen
UFRGS

Dr. Gabriela Massa
INTA-AR

Dr. Thais Ribeiro Santiago
Embrapa Agroenergy

Dr. Karoline E. Duarte
Embrapa Agroenergy

About Course and Candidate Selection

The course will be held from July 22 to July 26, 2019, at the facilities of Embrapa Genetic Resources and Biotechnology (Brasília-DF, Brazil) and has as a target audience, graduate students and researchers. There will be 15 vacancies, 6 for Brazilian participants, 4 for Argentine participants, 2 for participants from Uruguay, 1 for Colombia, 1 for Paraguay and 1 for other Latin American countries. The participant's selection will be made by completing a specific form (attached) that should be sent to the e-mail **cbab.crispr.2019@gmail.com** with the **supervisor's recommendation letter**, as well as fill out the form present on CBAB/CABBIO website **https://goo.gl/forms/L8iZaSNWV6XfiruC3**. The attached form must include a justification (in English) of up to 250 words in which the candidate must give a dissertation about his research project that can use CRISPR/Cas9 technology as a tool. The deadline for registration will be **June 7, 2019**, without exception. The course organization will provide a fixed grant for the 7 days to all selected candidates. The flight tickets will be provided only to Brazilian participants.

Requisites

Candidates must have basic knowledge of Molecular Biology and Bioinformatics (BLAST, DNA alignment, among others), as well as a foreign language (English) since classes will be taught in Portuguese and/or English. The organization committee strongly urges each selected candidate to bring his notebook and lab coat to the hands-on classes. Also, each candidate is asked to provide information about DNA sequences that can be edited by CRISPR technology, such as origin (plant species), number of copies in the target genome, positioning of known domains, among other information that the candidate deems necessary for practical class discussion in case studies. On the last day of the course each candidate will have 10 minutes to present their project and how CRISPR technology could be applied.

Supported by CNPq FAPDF SBBiotec Embrapa UCB BENSON HILL BIOSYSTEMS

COURSE PROGRAM

22th July

Time	Title	Speaker(s)
08:15 – 10:00	Introduction to Biotechnology	Dr. Maria Fatima Grossi de Sa
10:00 – 10:15	**Coffee Break**	
10:15 – 12:00	Introduction to CRISPR technology	Dr. Fabricio Arraes Dr. Marcos Bassos
12:00 – 13:00	**Lunch**	
13:00 – 15:15	*In silico* tools to sgRNA design (I)	Dr. Fabricio Arraes Dr. Thais Ribeiro Santiago Dr. Cíntia M. Coelho
15:15 – 15:30	**Coffee Break**	
15:30 – 17:45	*In silico* tools to sgRNA design (II)	Dr. Fabricio Arraes Dr. Thais Ribeiro Santiago Dr. Cíntia M. Coelho

23th July

Time	Title	Speaker(s)
08:15 – 10:00	Genome edition – Plant transformation methods	Dr. Bruno Paes de Melo
10:00 – 10:15	**Coffee Break**	
10:15 – 12:00	Genome edition – Detection methods	Dr. Thais Ribeiro Santiago
12:00 – 13:00	**Lunch**	
13:00 – 15:15	*In vitro* validation of sgRNA (I)	Dr. Carolina Morgante Dr. Isabela Lourenço Tessutti
15:15 – 15:30	**Coffee Break**	
15:30 – 17:45	Protoplast transformation (I)	Dr. Karoline E. Duarte

24th July

Time	Title	Speaker(s)
08:15 – 10:00	Genome editing in monocots: Sugarcane as a model	Dr. Hugo B. C. Molinari
10:00 – 10:15	**Coffee Break**	
10:15 – 12:00	Genome editing in *Solanum tuberosum*	Dr. Gabriela Massa
12:00 – 13:00	**Lunch**	
13:00 – 15:15	*In vitro* validation of sgRNA (II)	Dr. Carolina Morgante Dr. Isabela Lourenço Tessutti
15:15 – 15:30	**Coffee Break**	
15:30 – 17:45	Protoplast transformation (II)	Dr. Karoline E. Duarte

25th July

Time	Title	Speaker(s)
08:15 – 10:00	Synthetic Biology in genome editing new Era	Dr. Elíbio L. Rech Filho
10:00 – 10:15	**Coffee Break**	
10:15 – 12:00	Challenges for genome editing in plants using new CRISPR nucleases	Benson Hill - USA
12:00 – 13:00	**Lunch**	
13:00 – 15:15	Crop transformation (I)	Dr. Bruno Paes de Melo
15:15 – 15:30	**Coffee Break**	
15:30 – 17:45	Crop transformation (II)	Dr. Bruno Paes de Melo

26th July

Time	Title	Speaker(s)
08:15 – 10:00	Use of CRISPR technology for crop modifications in Argentina	Dr. Sergio Enrique Feingold
10:00 – 10:15	**Coffee Break**	
10:15 – 12:00	Regulatory aspects of CRISPR technology for crop modification in Brazil	Dr. Alexandre Nepomuceno Dr. Eduardo Romano
12:00 – 13:00	**Lunch**	
13:00 – 15:15	Case studies – Genome editing approach (I)	All Speakers
15:15 – 15:30	**Coffee Break**	
15:30 – 17:45	Case studies – Genome editing approach (II)	All Speakers

Yellow: Theoretical classes; *Green:* Practical classes

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Application Form (send to cbab.crispr.2019@gmail.com along with the supervisor's recommendation letter)

Complete Name:

E-mail:

Nationality:

Academic Training/Profession:
(undergraduate, master student, PhD student, post-doc, researcher)

Institution:

Justification (250 words – English):