

Invitation to the Biological Colloquium

Tuesday, 01.07.2025, 5.00 pm, H8

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“Manipulating the mitochondrial genome of tobacco”

Targeted modification of the plant mitochondrial genome has been a long-standing desired goal of the research community and only in recent years it has become feasible. Key to this are transcription activator-like effectors (TALEs), or more precisely base editors and nucleases (TALENs) that build on these. TALENs are protein-only, freely programmable site-specific DNA endonucleases. TALEN-encoding transgenes can be delivered to the nucleus via classical transformation techniques, while the resulting proteins can be easily targeted to the mitochondria by adding an N-terminal mitochondrial presequence.

Using TALENs, we have managed not only to introduce point mutations, but now also to completely remove the *nad9* gene from the mitochondrial genome of *Nicotiana tabacum*, creating a full knock-out. While the removal of *nad9* was coupled to genome rearrangements via recombinations in most of the lines, we also succeeded in isolating a few lines with a clean deletion, without any additional alterations in the mitochondrial genome.

The mutant plants lack the entire complex I in their respiratory chain, but are viable. They display a distinct phenotype, most notably delayed germination and growth as well as altered leaf and flower morphology. They are also male sterile. By allotopic expression of *nad9* in the nucleus, we could fully rescue the *nad9* knock-out phenotype, including reversion to male fertility. We thus have created an artificial cytoplasmic male sterility (CMS) system.

All colleagues, students and guests are cordially invited!