Establishment & Application of Biotechnologies in *Camelina sativa*

GEORG-AUGUST-UNIVERSITÄT GÖTTINGEN

IPK GATERSLEBEN

UNIVERSITÄT BONN

Prof. Dr. Ivo Feussner
Dr. Martin Fulda
Dr. Amelie Kelly

Dr. Jochen Kumlehn
Ingrid Otto

Prof. Dr. Peter Dörmann
Dr. Georg Hölzl

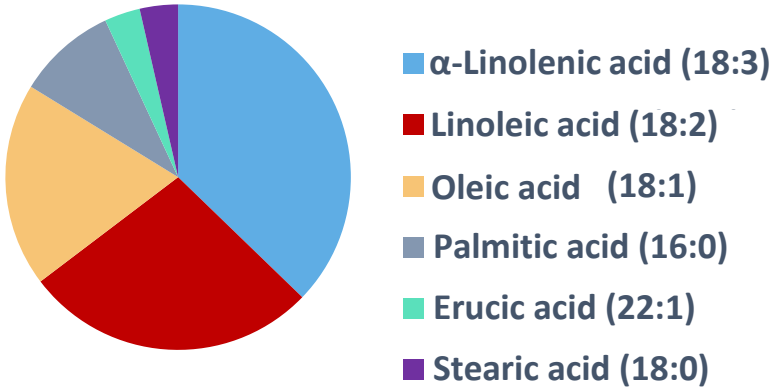
Barno Rezaeva

15th International Rapeseed Congress
19.06.2019

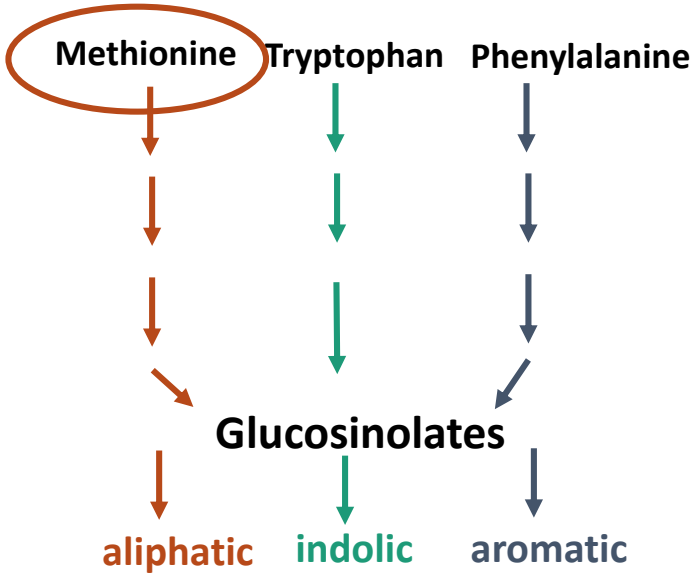
Glucosinolates accumulating in seeds affect the nutritional value

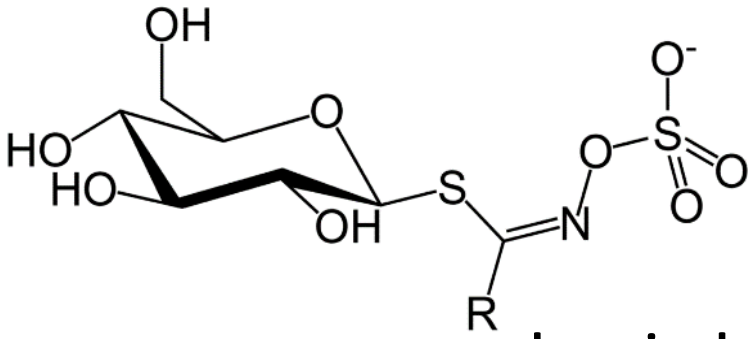
Camelina sativa

Fatty acid composition of camelina oil



***HIGH ALIPHATIC GLUCOSINOLATE* (*HAG1* = *MYB28*)**





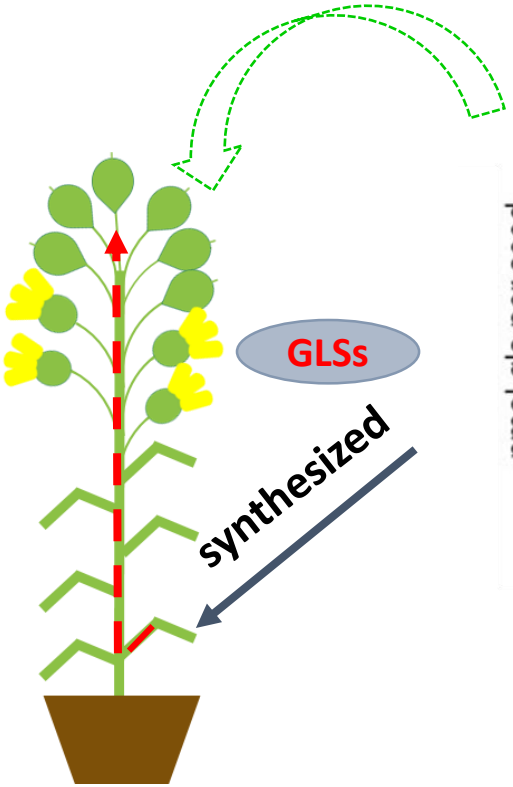
glucosinolate

Camelina, Ehrensing & Guy, 2008

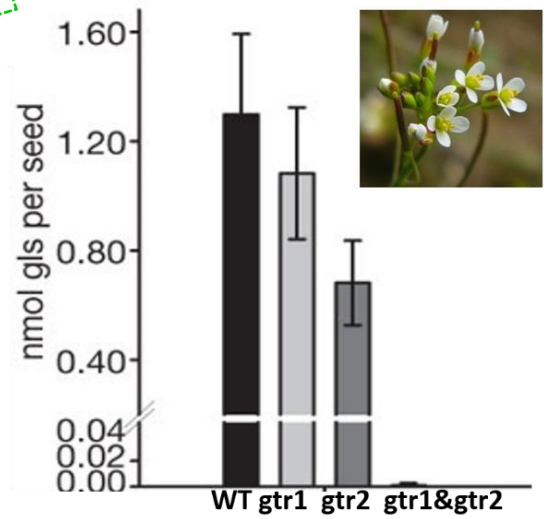
Glucosinolates are imported to seeds

***GLUCOSINOLATE TRANSPORTER* genes (*GTR1, GTR2*)**

– essential for transport and accumulation of glucosinolates (GLSs) in seeds

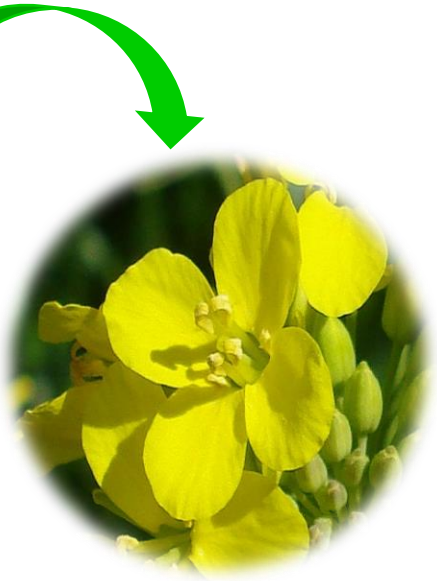


Camelina sativa



Total GLSs per seed in *A. thaliana*

Nour-Eldin et al., Nature 2012



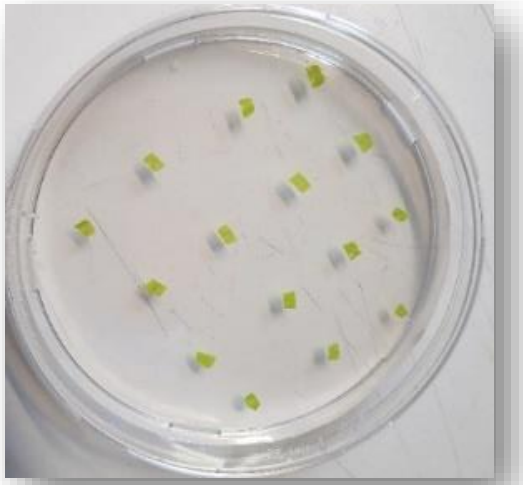
60-70% reduced GLSs in seeds of *B.rapa* & *B.juncea*

Nour-Eldin et al., Nat. Biotechnology 2017

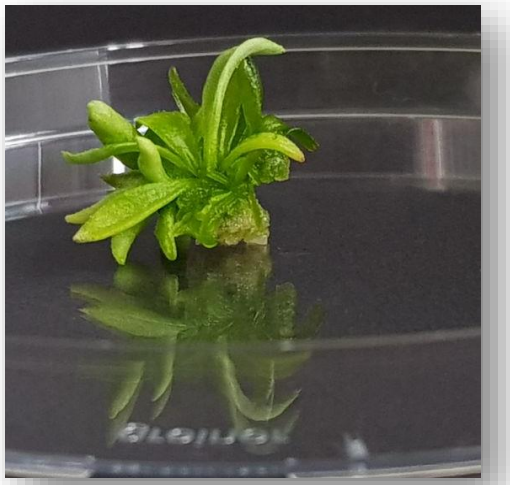
Plant Regeneration via Adventitious Shoot Formation

Explants:

- Hypocotyl
- Cotyledon
- True leaf



Leaf segments from seedlings

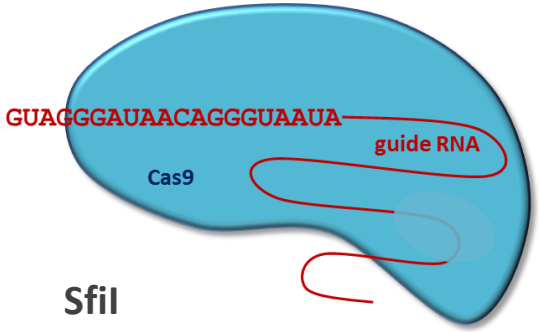


Shoot formation

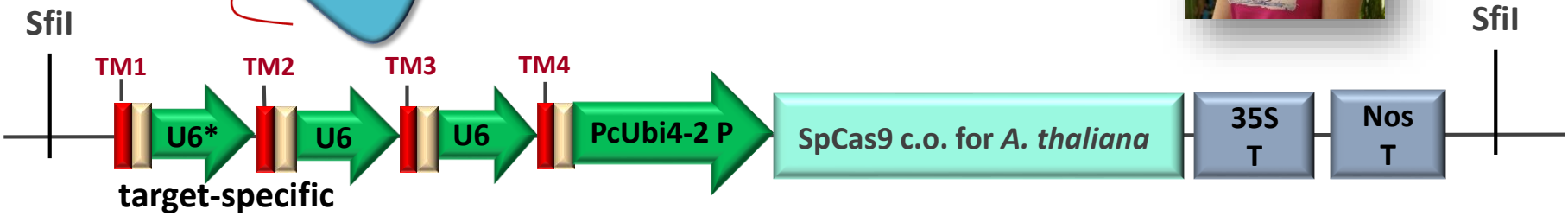
Plants on rooting medium

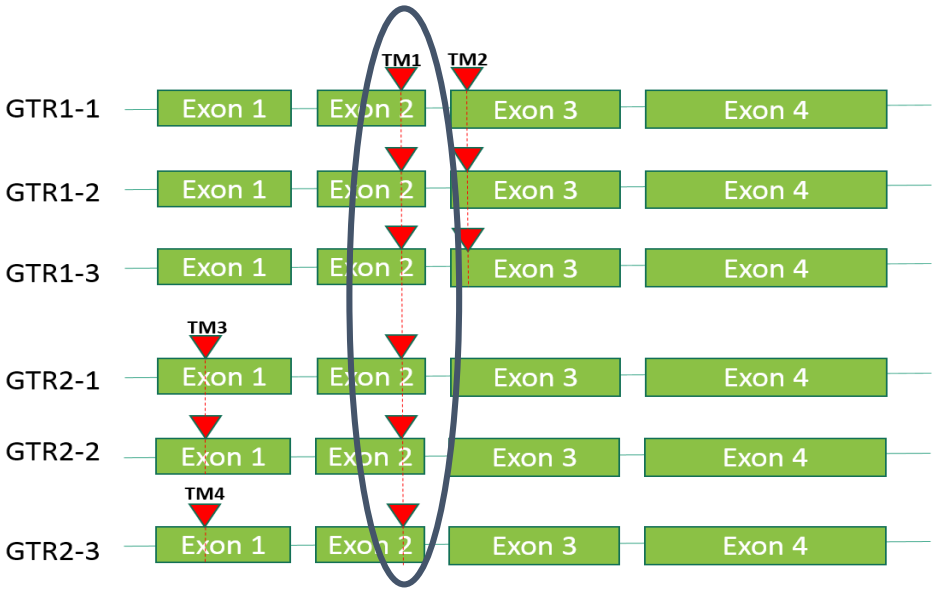
Regenerated plant

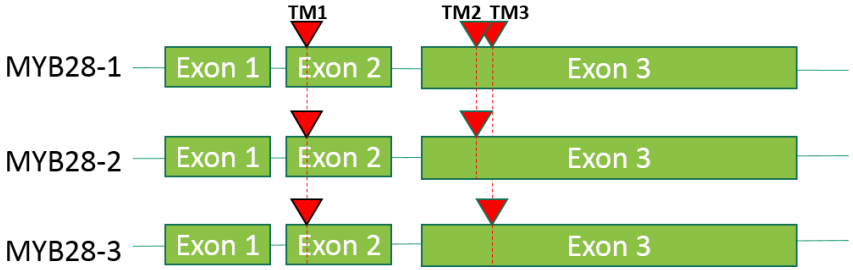
Selection of gRNA/Cas9 Target Motifs (TM) in *GTRs* & *MYB28*



Iris Koeppel
PhD student





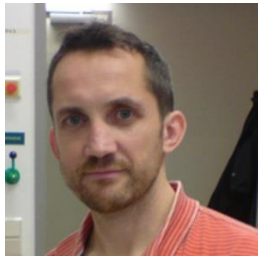


DESKGEN™ CRISPR Libraries
AI-designed for more effective and affordable guides, with fewer false negatives.

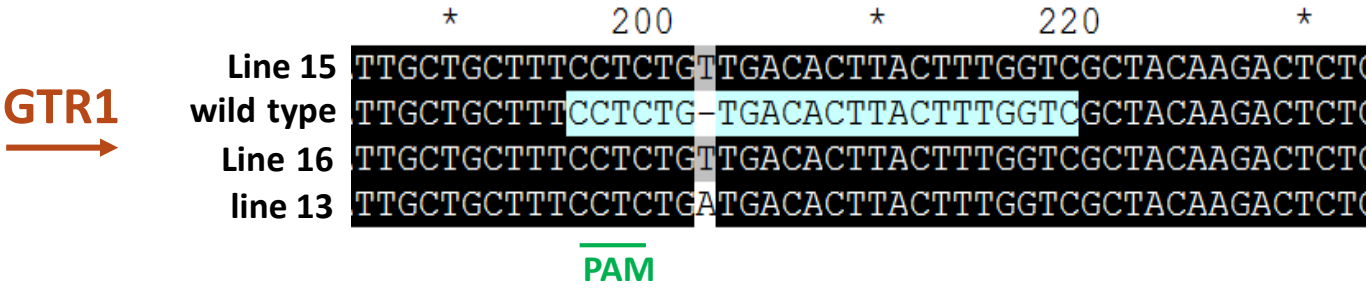
RNAfold WebServer

*AtU6-26 P

Sequence results of mutations in *MYB28* & *GTR1*



Dr. Georg Hölzl



Doubled haploids (DH):
Individuals with the chromosome number of haploids being doubled

In vitro

- Ovule/ovary/culture
- Anther/microspore culture

In vivo

- Spontaneous
- Hybridization

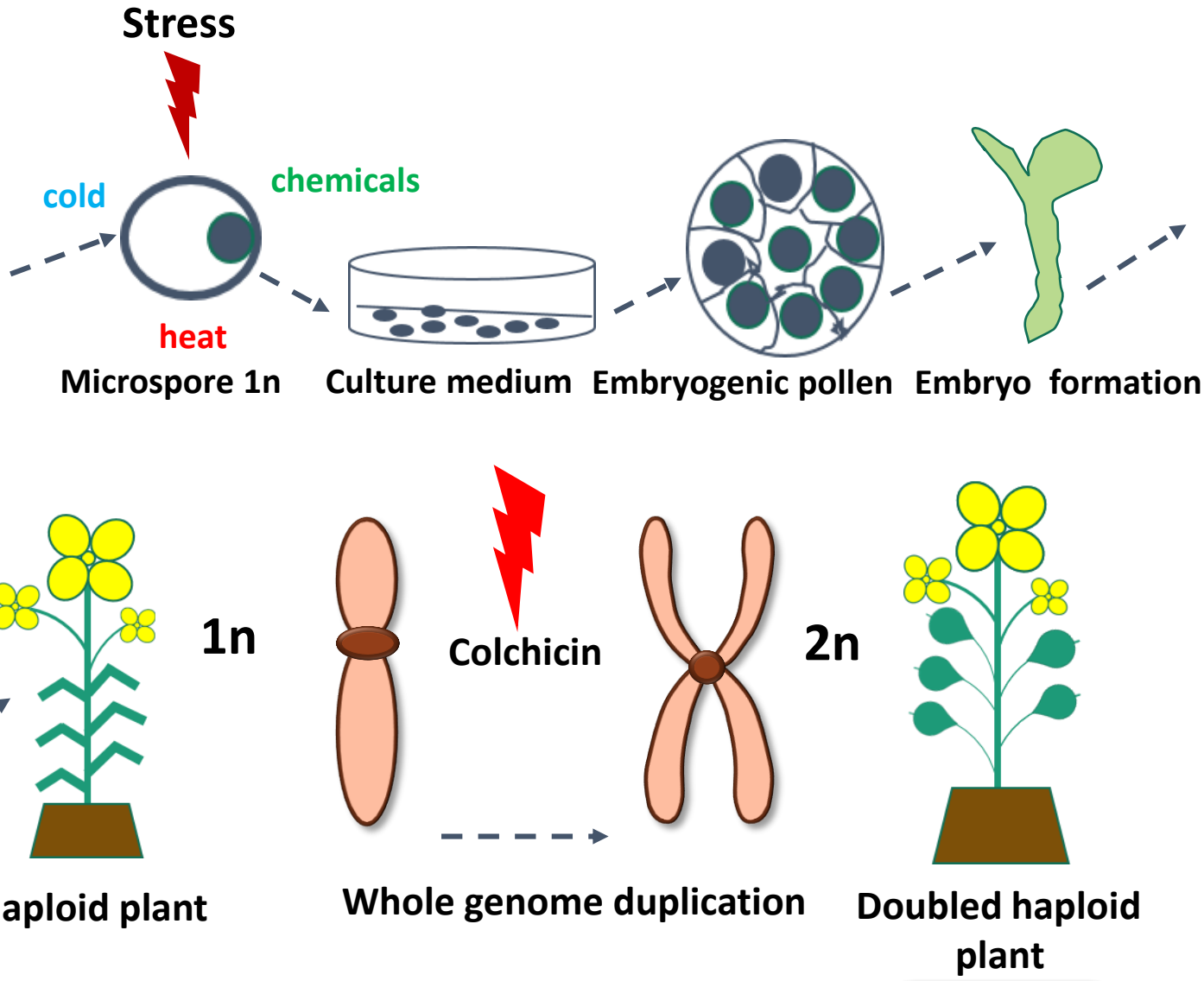
Doubled haploids:
Individuals with the chromosome number of haploids being doubled

In vitro

- Ovule/ovary/culture
- **Microspore culture**

In vivo

- Spontaneous
- Hybridization



Regeneration from Microspores

Cotyledonary stage

Plants on rooting medium

DH plant in soil

Summary & Outlook

- ✓ **Adventitious shoot formation from seedling explants is established**
- ✓ **First doubled haploids from isolated microspores are obtained**

- ➢ **Experiments on genetic transformation are in progress**
- ➢ **Knockout of candidate genes by gRNA/Cas9 is in progress**

Acknowledgments

Dr. Jochen Kumlehn

Dr. Sindy Chamas

Ingrid Otto

Petra Hoffmeister

Carola Bollmann

PRB group members

Bundesministerium für Bildung und Forschung

Leibniz Association

PRB

GEORG-AUGUST-UNIVERSITÄT GÖTTINGEN

UNIVERSITÄT BONN

Regeneration from Microspores