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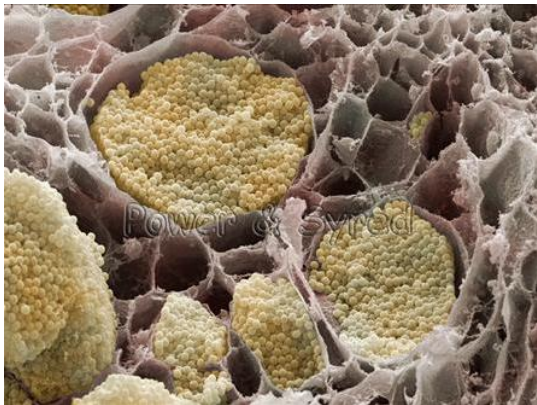
Berlin

Transferring clubroot resistance by intergeneric hybridizations between *Brassica napus* and *Raphanus sativus*



International Clubroot Workshop
Edmonton August 2018

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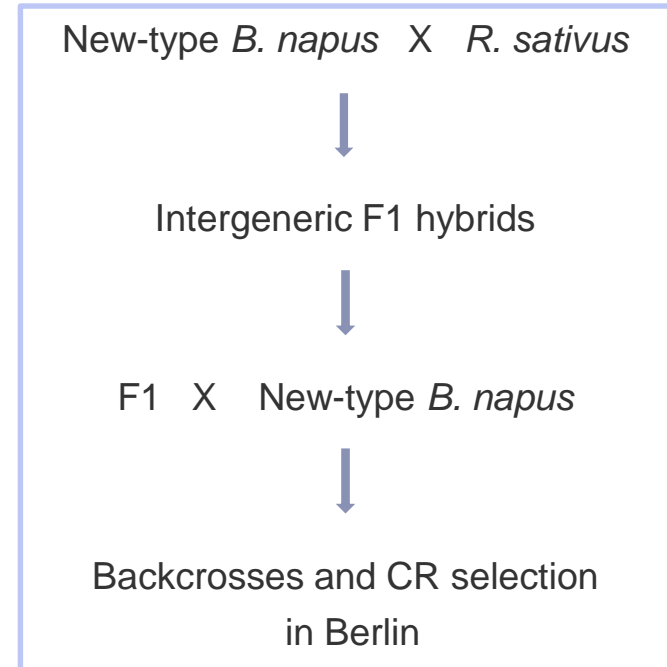


Intergeneric transfer of Raphanus CR

- McNaughton 1973: Raphanobrassica, *Brassica oleracea*, fertility problems
- Akaba et al. (2009): Monosomic addition lines *B. napus* x *R. sativus*, CR was allocated to one Raphanus chromosome
- Zhan et al. (2017): ((*R. sativus* x *B. oleracea* spp. *alboglabra*) x *B. napus*), CR present in BC2 progeny

Introgression of CR from radish into oilseed rape

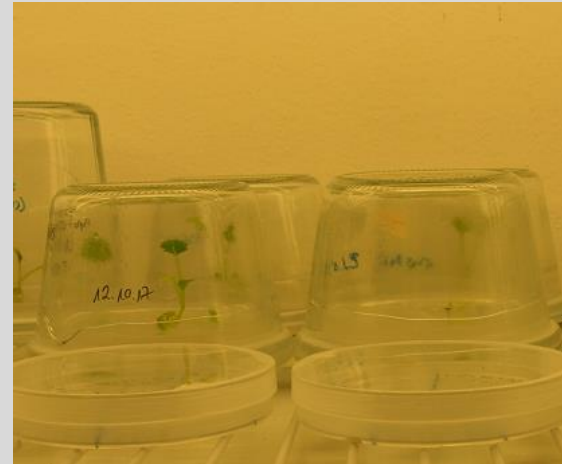
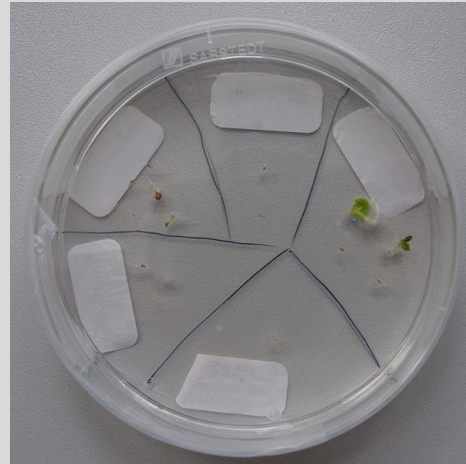
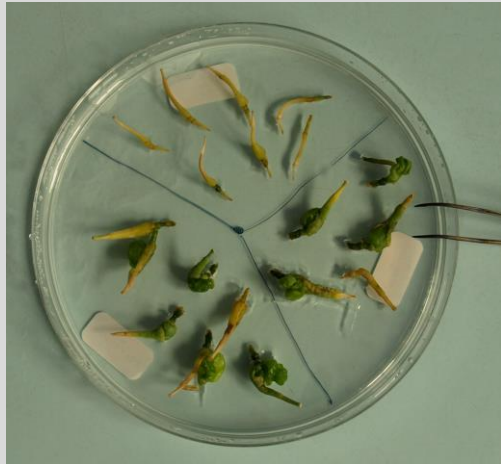
- CR from *Brassica napus* and *Raphanus* seems to be promising combination
- Cooperation HAU Wuhan, Norddeutsche Pflanzenzucht KG and FU Berlin
- Several back cross generations realized
- No embryo rescue needed from BC3F1 on
- Segregation and selection for CR in BC progeny, chromosome additions?
- BC progeny selected with combined CR against Mendel-virulent isolates and *Raphanus*-virulent isolate (ÜR14)



Safeguarding CR in Raphanus

- Oil radish is a major break or catch crop, usually only minor clubroot infections; virulent isolates are seldom, but present
- Increasing clubroot incidences in oilseed rape raise concerns about clubroot also in oil radish, no cash crop – no acceptance of disease incidences
- Reliable CR in oil radish, broaden genetic basis to avoid breakdown as with isolate ÜR14
- CR sources against ÜR14 isolate: Intrinsic CR? Transfer of resistance from *B. napus* to Raphanus by intergeneric crosses

Intergeneric transfer of *B. napus* CR



- New-type *B. napus* x *R. sativus*
- Combination of ovary and subsequent ovule culture, MS medium
- Proof of hybrid character with SSR markers
- CR testing on clonal plants

Results of intergeneric crosses

<i>B. napus</i> # maternal plants	<i>R. sativus</i> # pollinator genotypes	# Pollinated buds	# Siliques	# Ovules	# Seedlings	# Plantslets in soil
56 (31)*	15 (11)*	ca. 2900	2297	377	<u>130</u>	130/ 112**

*= # successful parental accessions in brackets; **= confirmed hybrids

- Major bottle neck was the number of ovules, ca. 1/3 of ovules germinated in our culturing conditions
- Four maternal plants according to markers, sufficient plants to study CR and start BC programm on selected individuals

Clubroot results of clonal plants

	Host	ÜR14 (1)	ÜR14 (2)	PbRaph2	Summary all tests
Mean score (0 - 3)	Radish	3	2.6	0	
	Oilseed rape	0	2.6	3	
	Yellow seeded Sarson (YSS)	3	3	3	
Number of	Resistant hybrids (score < 0.5)	33	43	28	24
	Hybrids with medium reaction (0.6-1.5)	25	7	27	42
	Susceptible hybrids (1.6-3.0)	40	41	53	42

24 hybrids were showing resistant reactions in all tests and are now raised for back crosses.

Segregation in hybrids might reflect genetic heterogeneity of Raphanus parent, effects of more than 1 locus likely

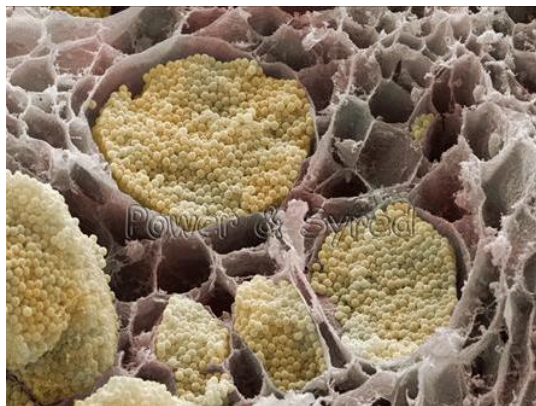
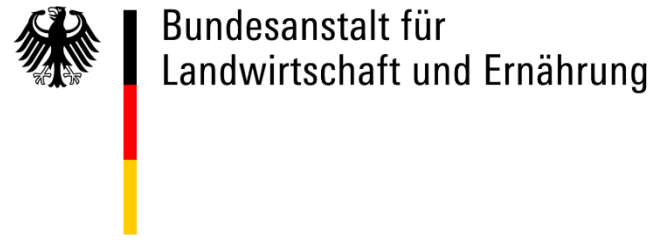
Outlook and conclusions

- Intergeneric incompatibility does not prevent the transfer of CR between Brassica and Raphanus when using embryo rescue
- CR from both species is expressed in intergeneric background, dominant CR?
- Relevance of introgression of *B. napus* CR into Raphanus will depend on further CR results on promising candidates from screening with compatible isolate
- Genetic analysis and mapping of CR will support the back crosses



Acknowledgements

- Your attention
- My co-workers: Nadine Gollinge, Lea Hördemann, Yasin Celik, Johanna Schulke
- Colleagues who supported the crosses and marker analysis: Jan Mader, Kerstin Lohgall
- Funding is gratefully acknowledged:



RAPHKORE cooperation partners:

Michaela Schlathölder

Jörg Schondelmaier

S. Lütke Entrup

