REPEAT POLYPLOIDIZATION WITH A NEW NUCLEAR PARTNER GENOME CAN RESULT IN VERY SIGNIFICANT GENOMIC AND MORPHOLOGICAL CHANGES IN BRASSICA DIGENOMICS: *B. JUNCEA* AS AN EXAMPLE

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RAPESEED - MUSTARD

Area (million ha)
- Canada: 6.49
- China: 6.10
- India: 6.30
- European Union: 6.49

Production (million tonnes)
- Canada: 21.43
- China: 13.66
- India: 7.20
- European Union: 11.83

Productivity (t/ha)
- Canada: 2.68
- China: 1.94
- India: 1.14
- European Union: 1.88
TECHNICAL INEFFICIENCIES IN MUSTARD

Plant architecture
Indeterminate
Generally tall
Large Biomass
Low Harvest Index

Photosensitivity

Low Productivity

Heterosis: Low
Oil: ?

Biotic stresses
White rust
Alternaria Blight
Sclerotinia
Powdery mildew
Downey mildew
Mustard Aphid

Abiotic Stresses
Temperature
Water

NUE: Low
PUE: Low
GENETIC DIVERSITY IN MUSTARD
POSSIBLE STEPS FOR A BRASSICA GERMPLASM ENHANCEMENT

• Mobilizing left out genetic variation still available in land races, wild and weedy species.

• Replaying the evolutionary tape (resynthesis in polyploids):
  
  Direct from parental diploids
  Indirectly from related digenomics
RESYNTHESIS FROM RELATED DIGENOMICS: RATIONALE?

- At least one basic diploid progenitors (C/B) normally used to resynthesize digenomics is of poor breeding value.

- Natural digenomics in contrast are of excellent breeding value.

- Creation of new combination of genomes, which have previously evolved with different nuclear partner(s) was considered possible.
  
  For example:
  
  $B.\text{napus}(\ AACC) \times B.\text{carinata}\ (\text{BBCC}) = B.\text{juncea}(\text{AABB})$

Such a combination was expected to unleash the process of diploidization, perhaps stronger than in polyploids resynthesized from diploid progenitor parents.

Altered Nucleo-cytoplasmic interactions.

Seamless transfer of variation across species domains.
FERTILITY AND MEIOTIC STABILITY
GENOME SIZE VARIATION IN NEWLY SYNTHESIZED DERIVED B. JUNCEA AMPHIPLOIDS
POPULATION STRUCTURE ANALYSIS OF DERIVED BRASSICA JUNCEA
DERIVED AMPHIPLOIDS: PRACTICAL POSSIBILITIES
PLANT TYPE VARIANTS
DETERMINATE MUSTARD
LIFE HISTORY TRAITS IN DETERMINATE MUSTARD
PRODUCTIVITY OF CMS BASED MUSTARD HYBRIDS DEVELOPED BASED ON POPULATION STRUCTURE

Based on Averages of over 100 hybrids in large scale testing
ALSO DETERMINATE DERIVED *BRASSICA NAPUS*!
THANKS