



Specific whole-chromosome discrimination through oligonucleotide- based chromosome painting in *Brassica* species

Baez Mariana, Mann L, Heitkam T, Mason A

Plant Breeding Department

University of Bonn

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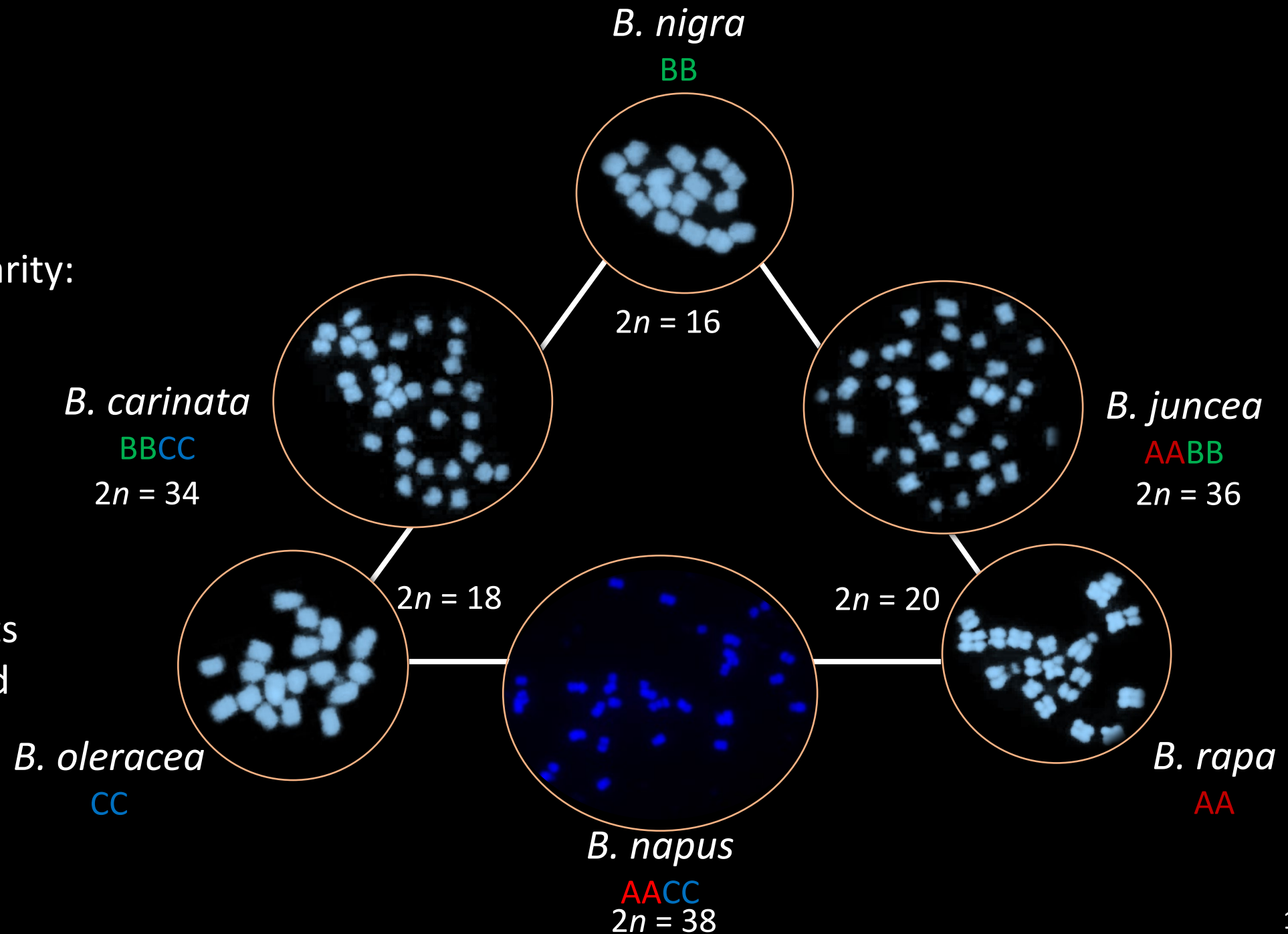


Brassica U's triangle

Chromosome similarity:

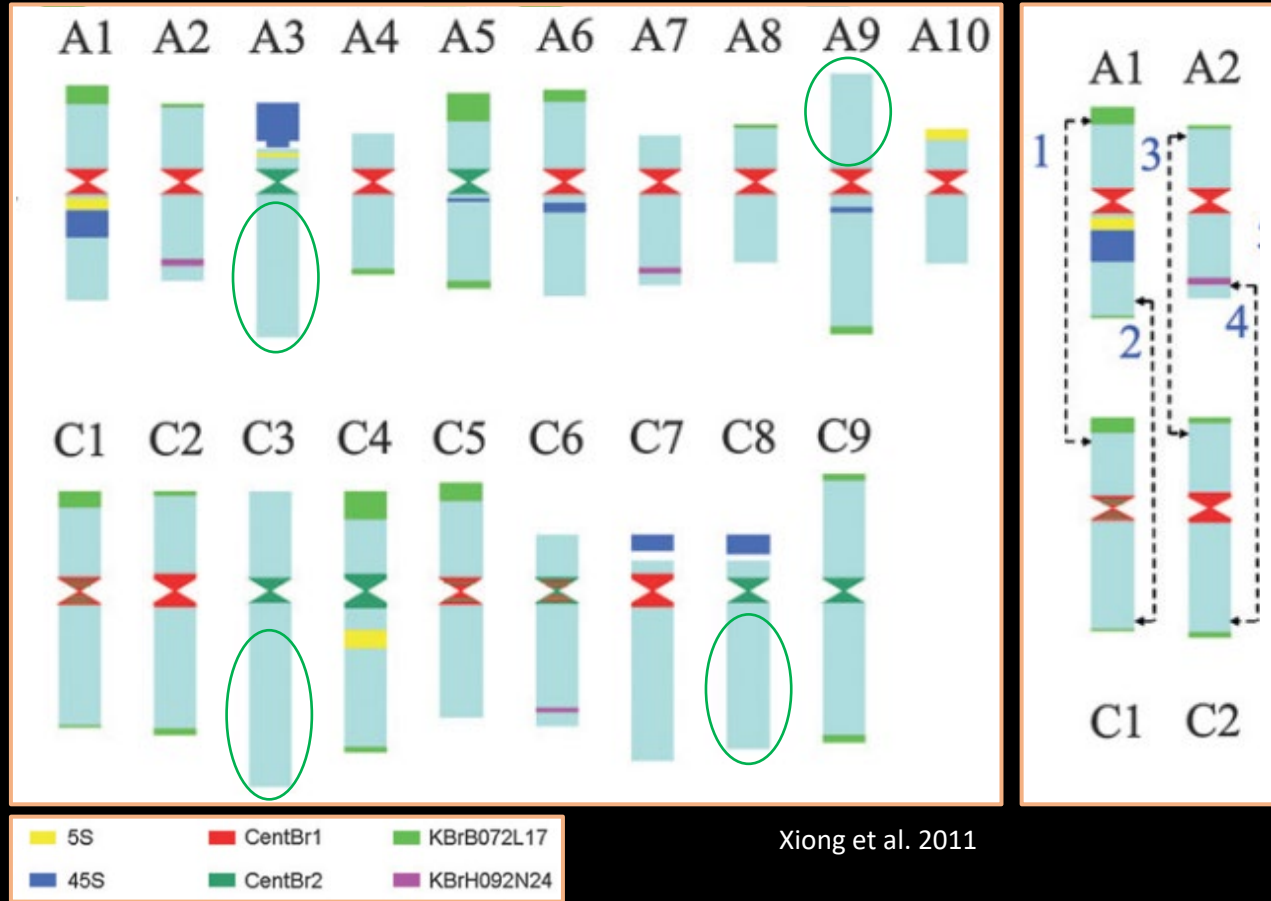
- Morphology
- Size

Chromosome events
difficult to observed



Chromosome specific discrimination

Numerous markers are necessary to discriminate each chromosome pair



Only possible to recognize rearrangements in the region where the specific marker is included

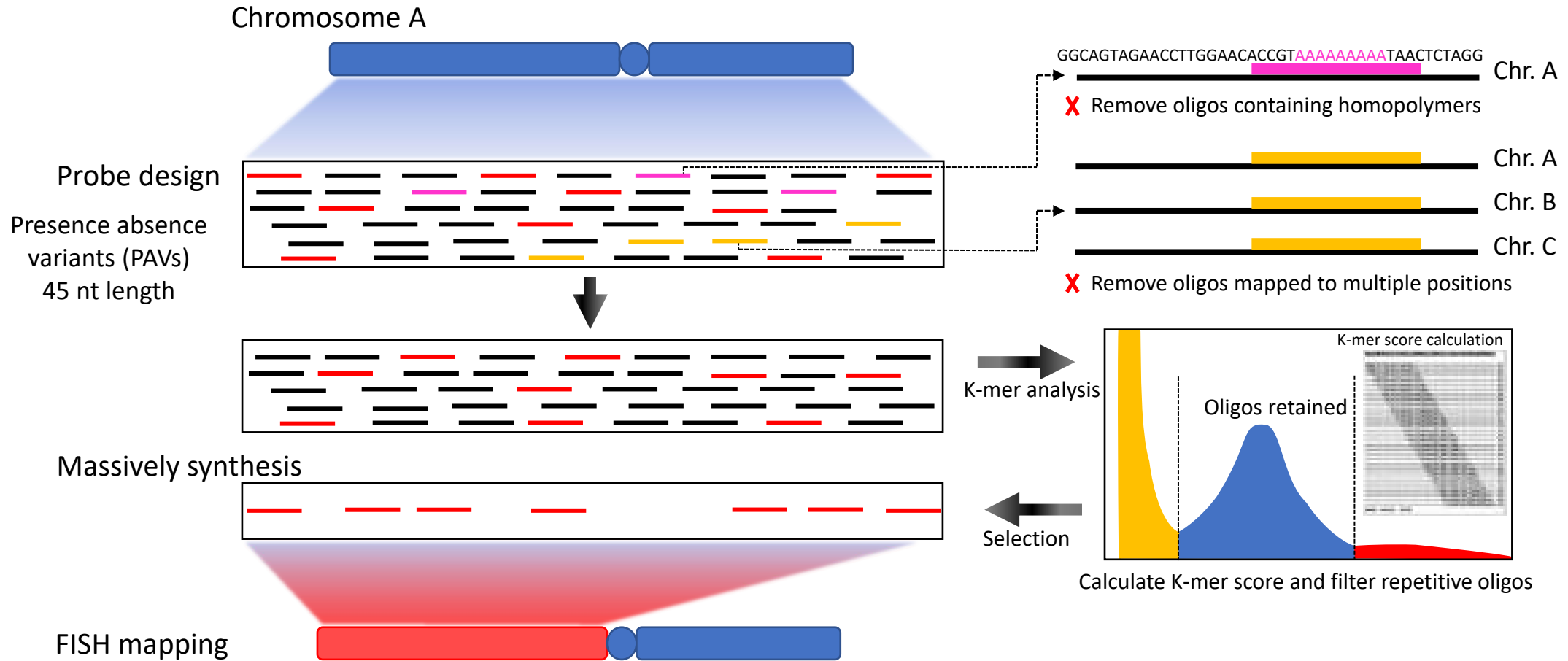
- Non specific marker probes or very laborious probes to obtain and maintain

Designed a oligonucleotide-based chromosome-specific probes for *Brassica*

- Oligos selected specific for two chromosome pairs
 - A1 chromosome: $\left\{ \begin{array}{l} B. napus A1 \\ B. rapa A1 \end{array} \right.$
 - C1 chromosome: $\left\{ \begin{array}{l} B. napus C1 \\ B. oleracea C1 \end{array} \right.$
- Diploid genomes (A, B, and C subgenomes) -> *B. rapa*, *B. nigra*, *B. oleracea*
 - *B. napus* (AC subgenomes)
 - Tetraploid genomes (AB, and BC subgenomes) -> *B. juncea*, *B. carinata*

Probe design flow

- Running Chorus2 with all single sub-genomes in one input file (ABC-genomes)



| Chromosome | Sequence length [bp] | Probes designed [#] |
|------------|----------------------|---------------------|
| A01 | 32,958,928 | 20,000 |
| C01 | 48,239,358 | 27,000 |

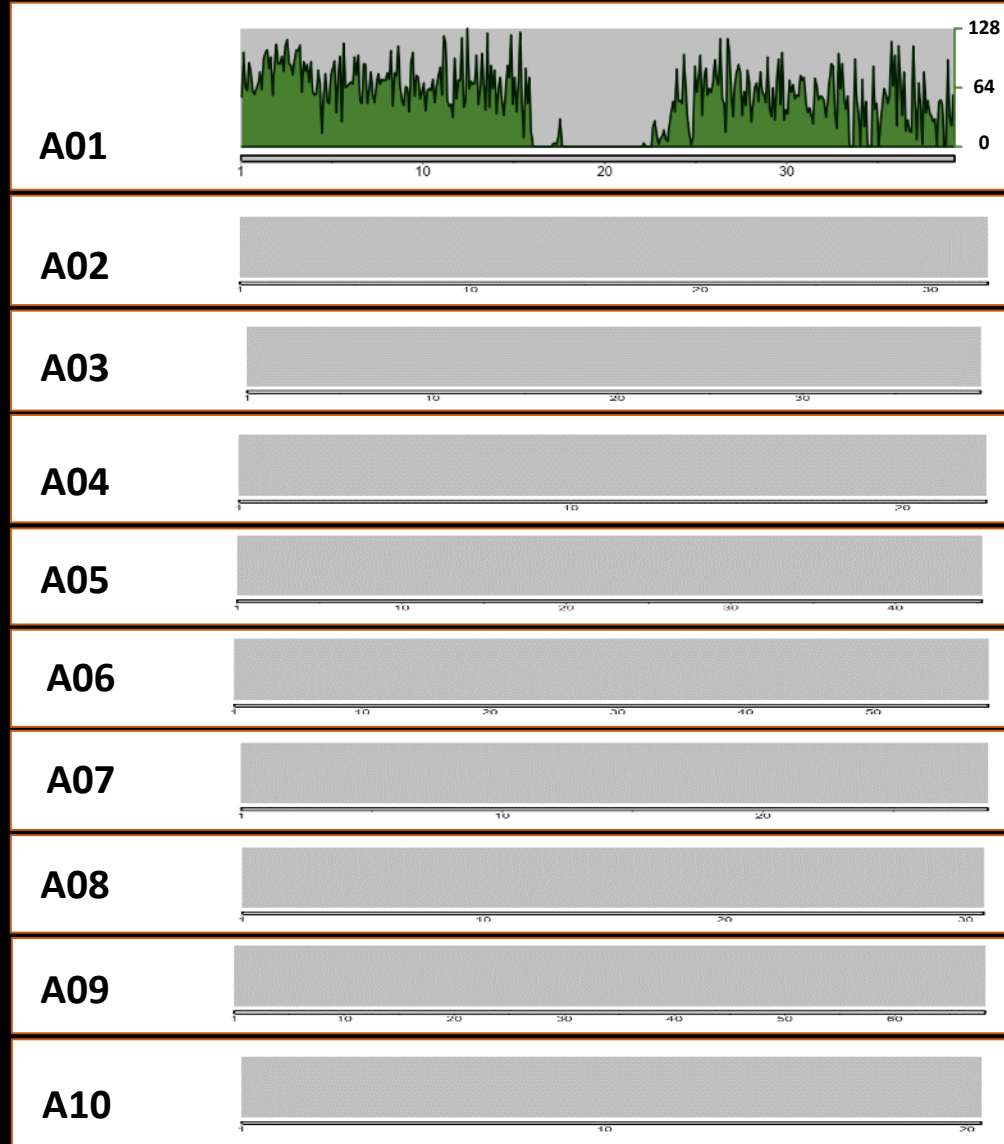
Oligo similarity with chromosome pseudomolecules

B. rapa (Z1, v2)

A1 specific oligos

N° oligos

50 kb window

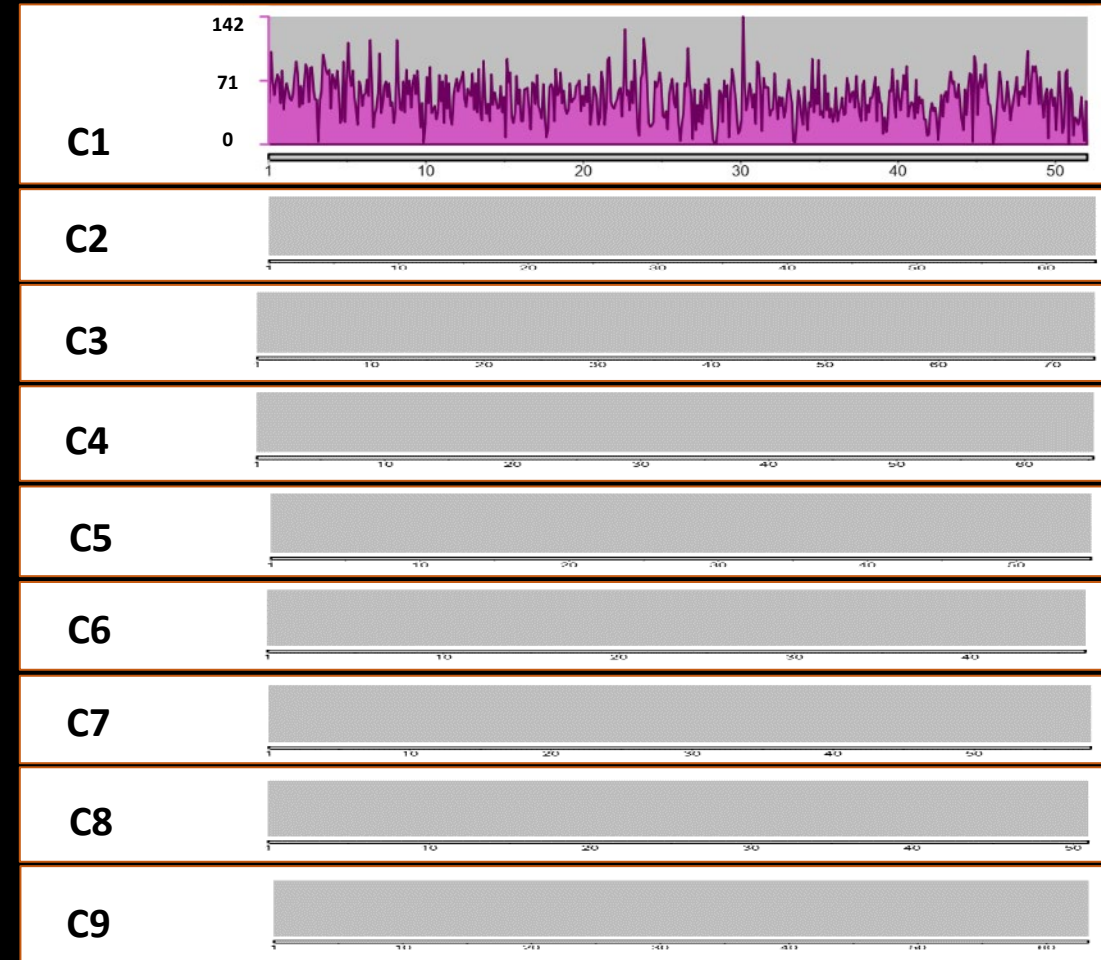


Chromosome length

B. oleracea (HDEM)

C1 specific oligos

N° oligos



Chromosome length

No sequence similarity of A1 or C1 specific oligos within other chromosome pairs

Oligo similarity with chromosome pseudomolecules

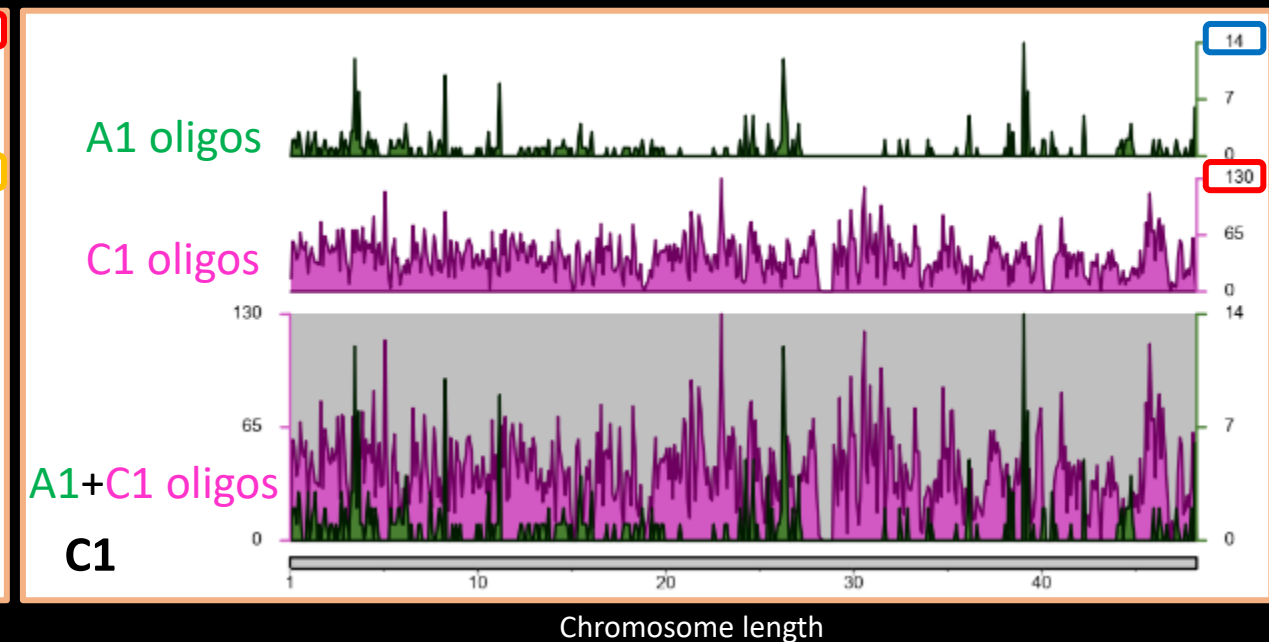
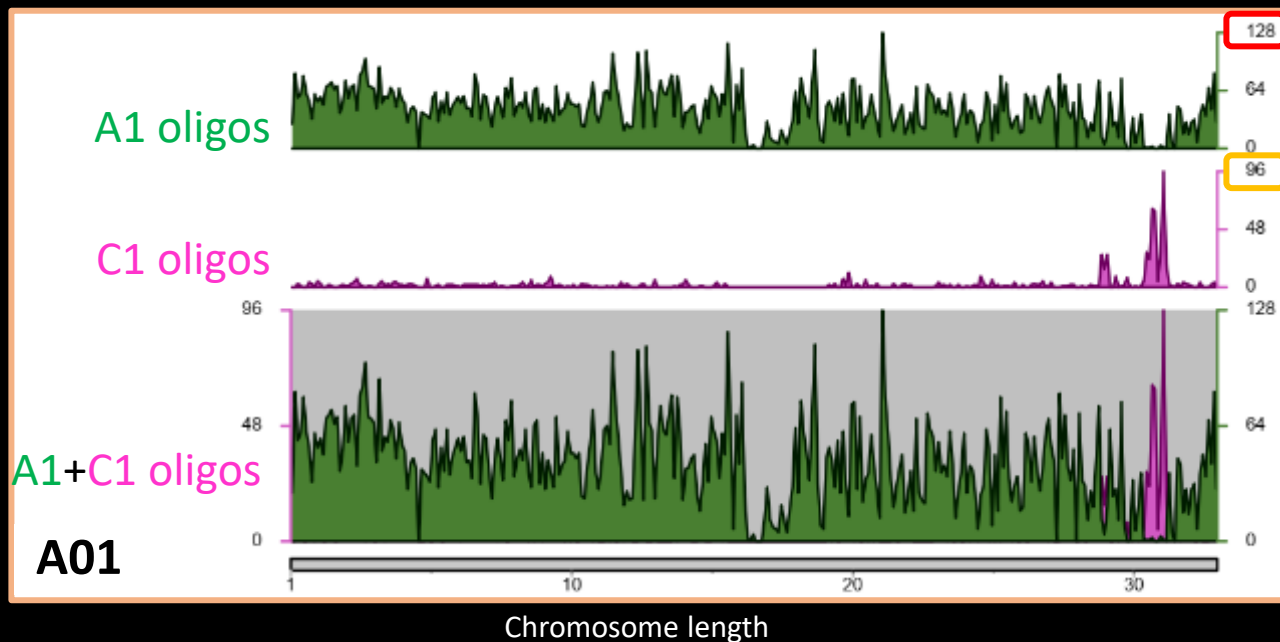
B. napus (Darmor-bhz v10)
AC genomes

A1 specific oligos

N° of oligos

C1 specific oligos

N° of oligos



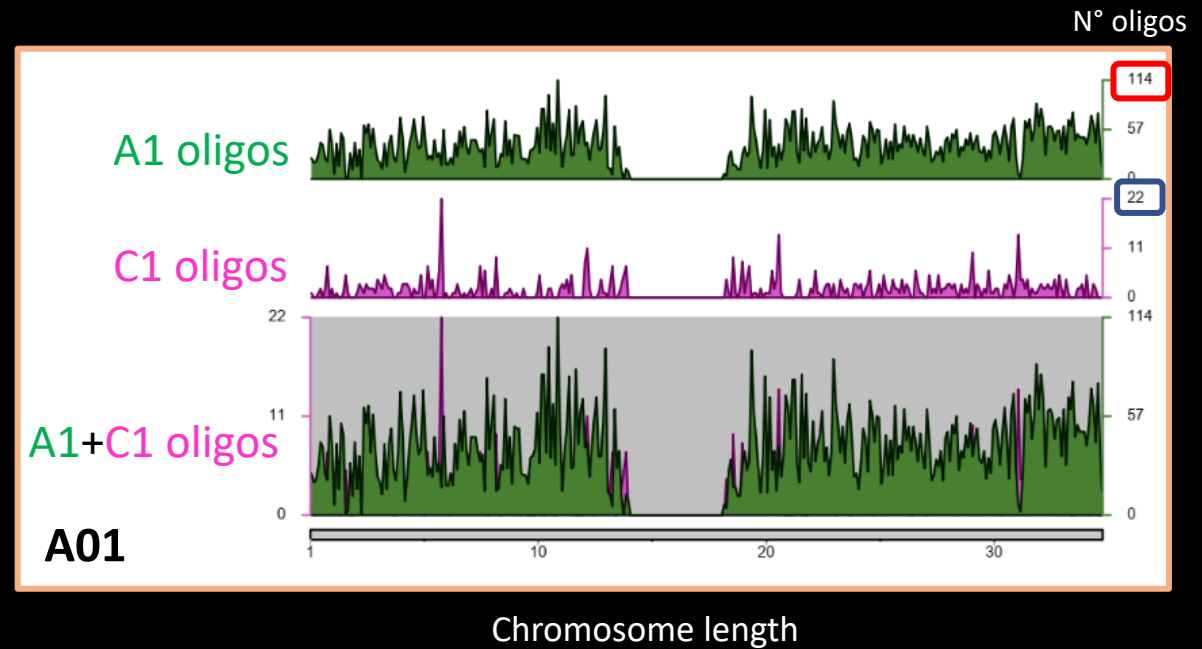
Probes specific within the paired sub-genomes with exceptions:

- Minor spots with a very low probe density (< 25)
- Spot on *B. napus* chr A01

Oligo similarity with chromosome pseudomolecules

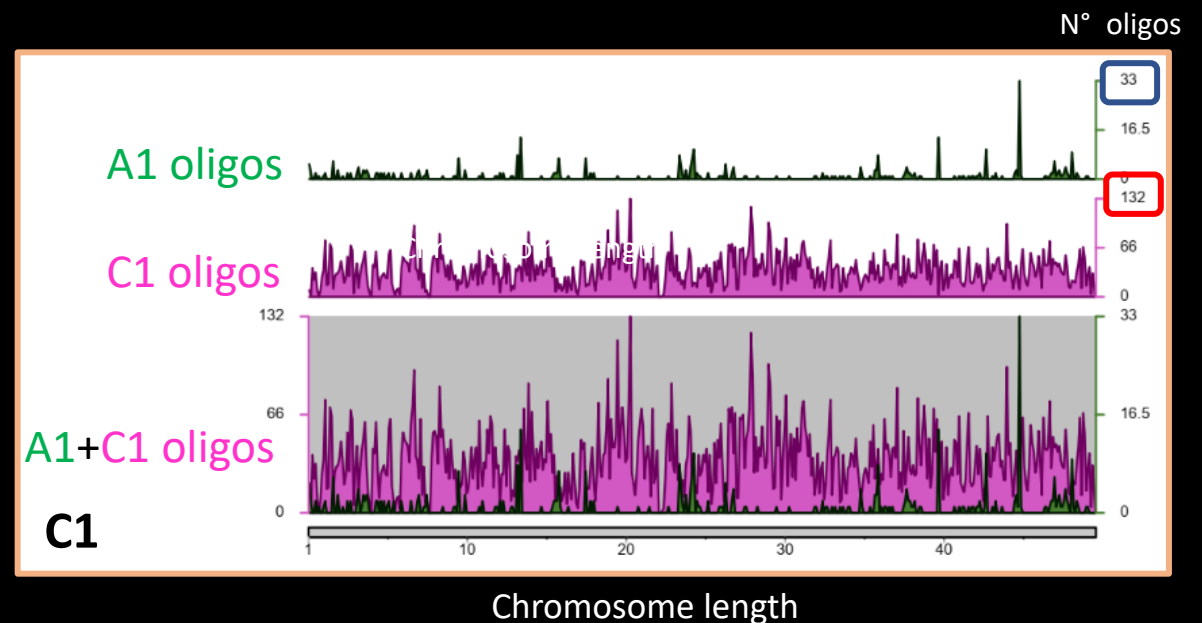
B. juncea AB genomes
(ASM1870372v1)

- A1 chromosome pseudomolecule



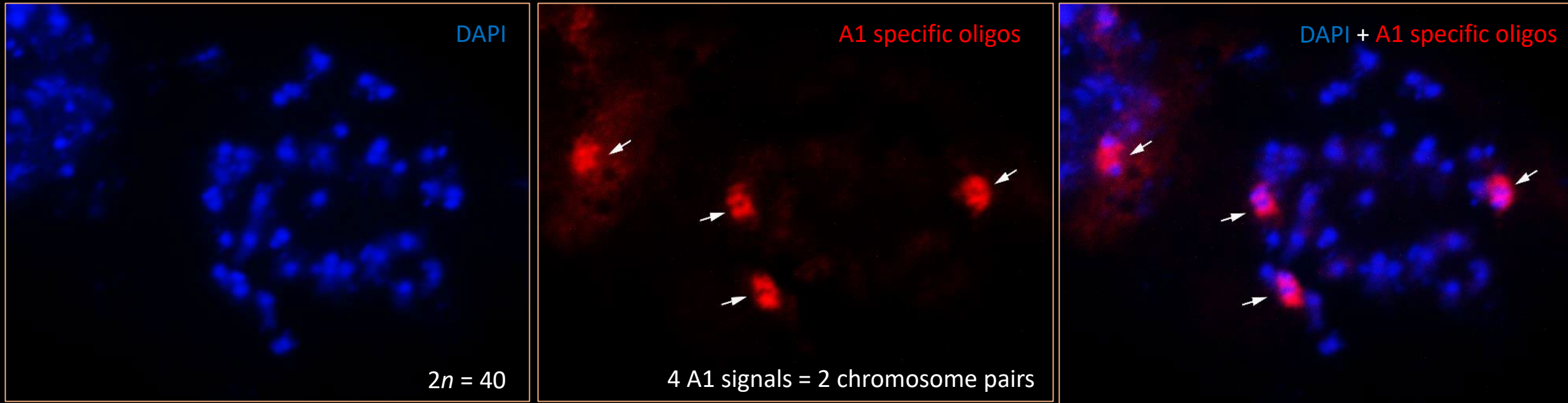
B. carinata BC genomes
(ASM1677196v1)

- C1 chromosome pseudomolecule



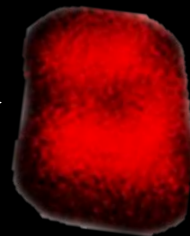
Chromosome mapping

Identified specific chromosome pair A1 in *Brassica rapa* A8-7 (tetraploid)



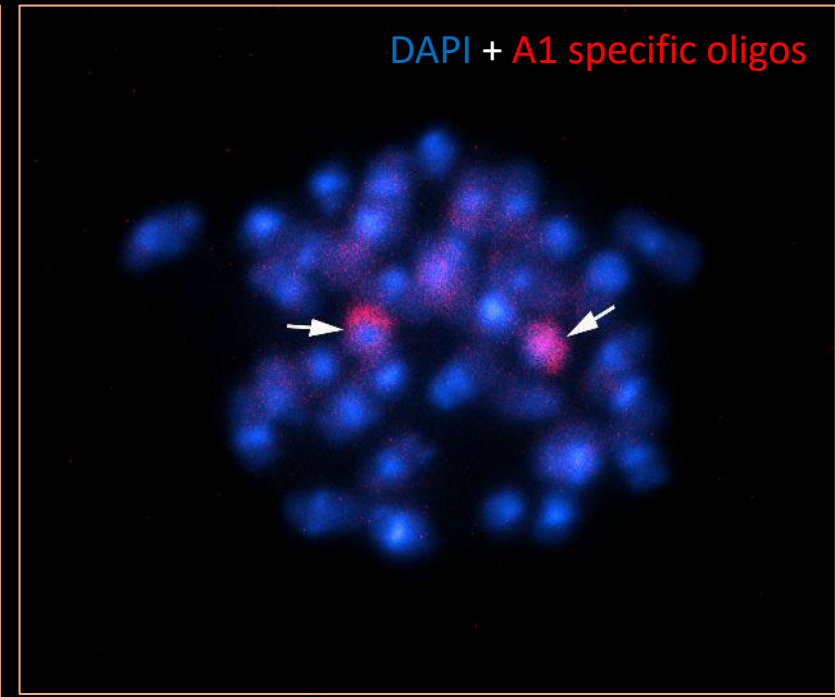
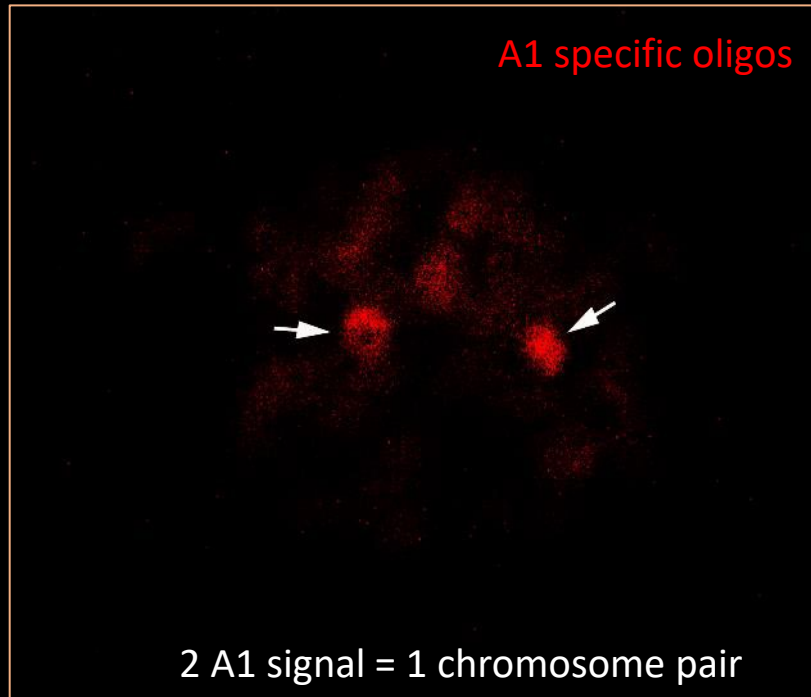
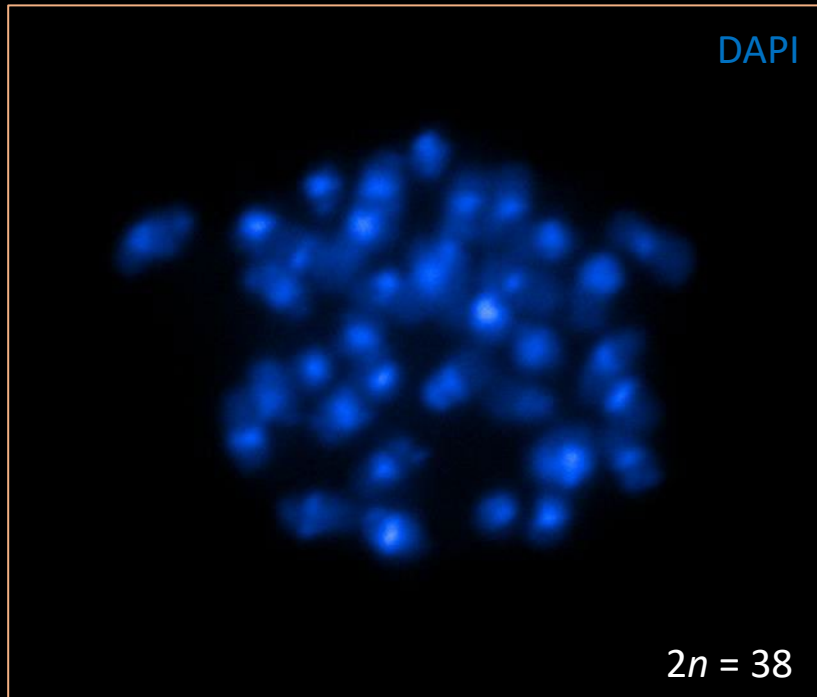
Mitotic chromosomes

Centromeric region -->

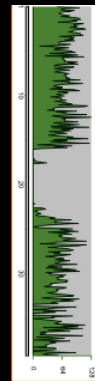
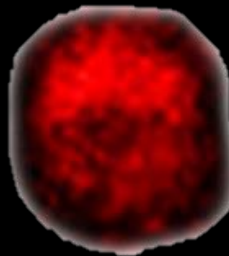


Chromosome mapping

Identified specific chromosome pair A1 in *Brassica napus* Ag Spectrum

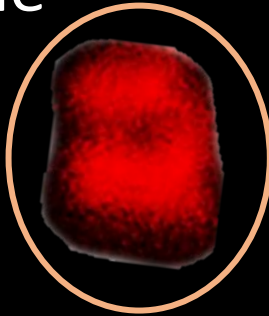


Centromeric region



Summary

- ✿ Chromosome specific probes for A1 and C1 chromosome pairs were designed
- ✿ A1 chromosome-specific probes can identify single chromosome pairs from *B. napus* and *B. rapa* (tetraploid) species
- ✿ Outlook -> Design chromosome specific probes for other chromosome pairs from A, C and B genome
 - B2, B4, B8 resistance related -> track introgressions



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oligonucleotide-based chromosome painting in *Brassica* species



Annaliese Mason
Plant Breeding Department
University of Bonn



Ludwig Mann



Tony Heitkam

