The current genome labeling of polyploid oats – How valid is it?

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The common genome labeling of polyploid oats

- AB, *A. barbata*
- AC, *A. magna, A. murphyi, A. insularis*
- ACD, *A. sativa* and its related forms

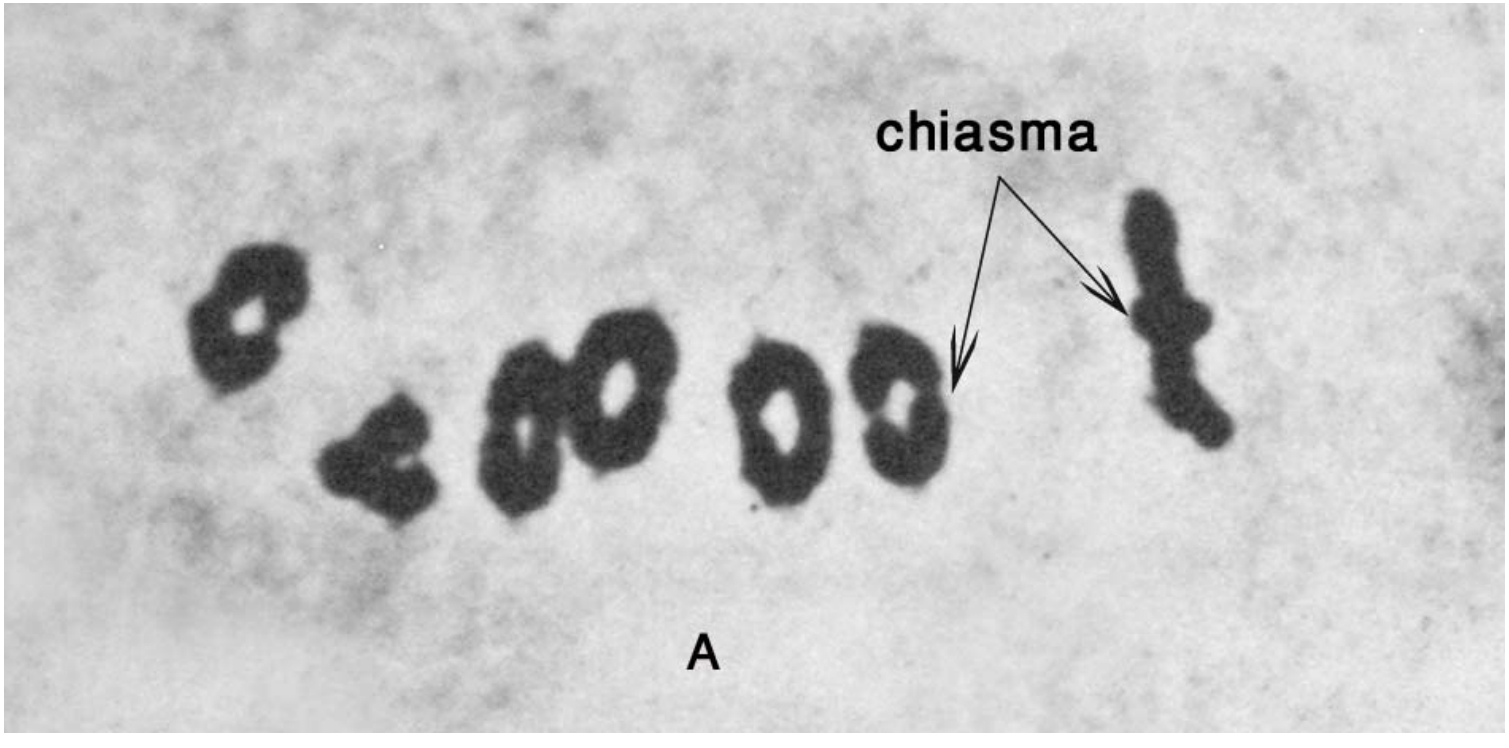
What is a Genome

- A genome is the chromosome set of the gamete or the two sets of the zygote in terms of:
- Number
- Size
- Shape
- Linear arrangement

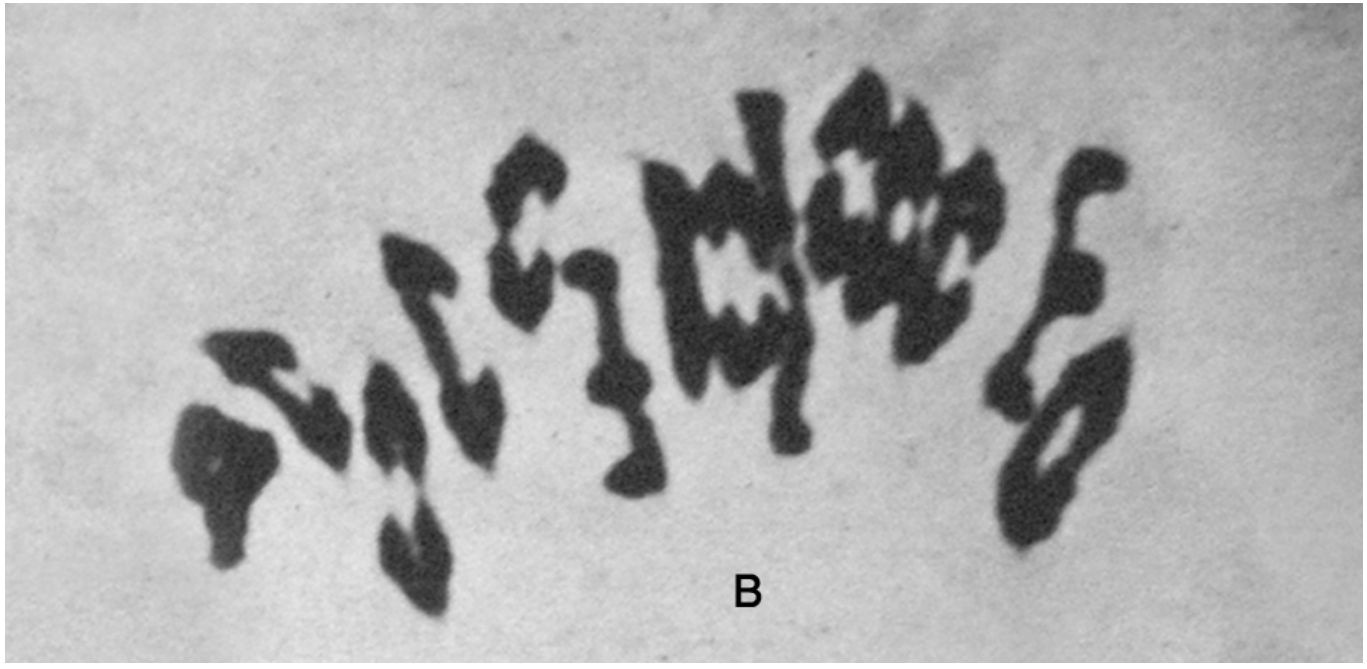
The history of genome labeling in oats

- Nishiyama (1929) determined the genomes A for *A. strigosa*, AB for *A. barbata* and ABC for *A. sativa*
- Rajhathy and Morrison (1959) determined ACD for *A. sativa*
- Rajhathy and Sadasivaia (1968) determined AC
- for *A. magna*

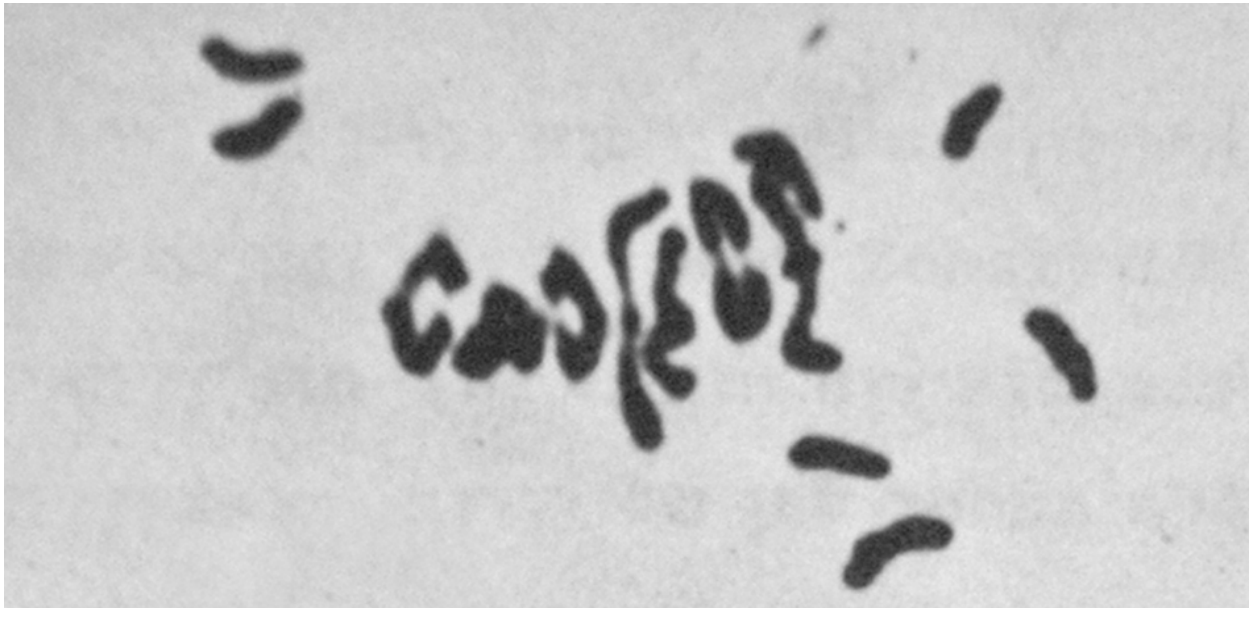
Chromosome association in MI of meiosis in *A. strigosa*



Chromosome association in MI of *A. barbata*



Chromosome association in MI of *A. barbata* x *A. strigosa*



Chromosome association in MI of *A. magna x A. pilosa*

Parents/ hybrids	2n	univalents	bivalents	trivalents	quadrivalents	Chiasma / cell
A. pilosa	14		7			12.90
A. magna	28		14			27.72
A. magna x A. pilosa	21	16.87	2.02	0.02		2.2

Chromosome association in MI of *A. magna x A. strigosa*

Parents/ hybrids	2n	univalents	bivalents	trivalents	Quadrivalents	Chiasma / cell
A. strigosa	14		7			13.20
A. magna	28		14			27.72
A.magna x A.strigosa	21	12.65	3.15	0.61	0.05	6.10

Chromosome association in MI of A. magna x (A. strigosa x A. eriantha) amphidiplod

Parents/ hybrids	2n	univalents	bivalents	trivalents	quadrivalents	Chiasma/ cell
(A.strigosa x A. eriantha)^2	27	2.66	12. 17			20.54
A. magna x (A.s xA.e)^2	27	11.46	5.82	1.14	0.12	9.16

Chromosome association in MI of *A. sativa x A. strigosa*

Parents/ hybrids	2n	univalents	bivalents	trivalents	quqdrivalents	Chiasma/ cell
A. strigosa	14		7			13.20
A. sativa	42		21			41.50
A. sativa x A. strigosa	28	12,20	3.65	1.55	0.11	7.53

Dispersal units of *A. magna* & *A. murphyi* and *A. strigosa* & *A. eriantha*

Spikelet morphology of A. strigosa x A. eriantha amphidiploid

Habitat of *A. insularis*

Oat species participated in the origin of polyploid species

A. strigosa in the origin of *A. barbata* •

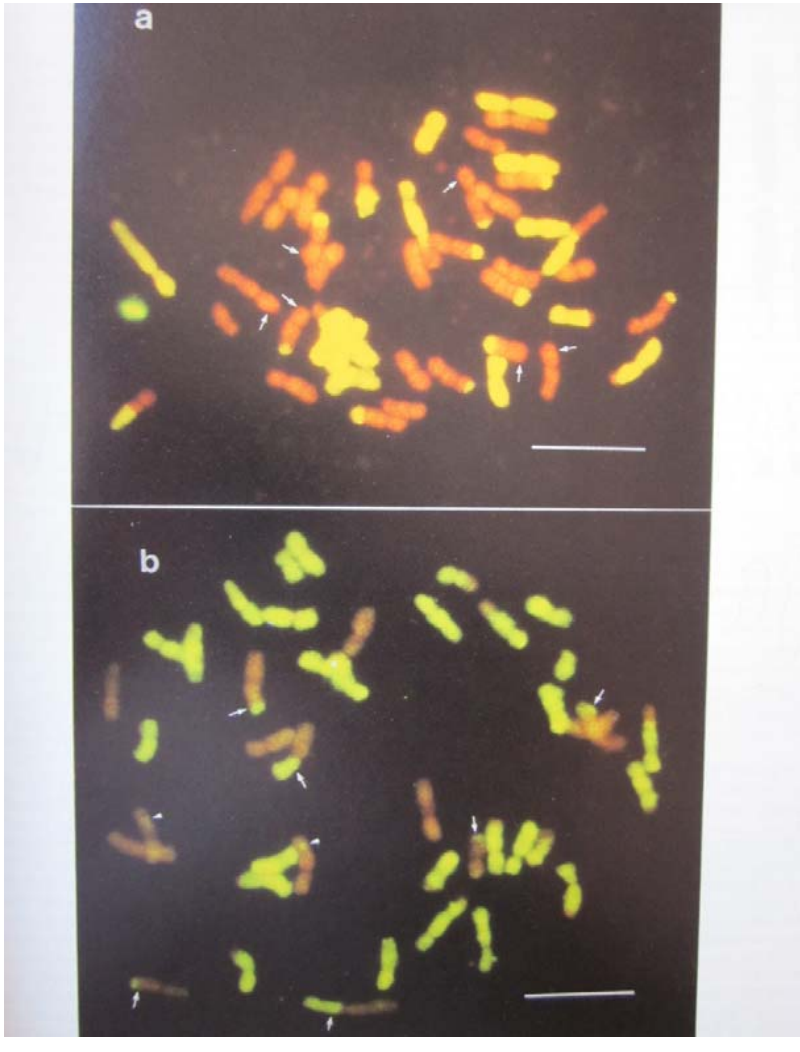
A.insularis in the origin of *A. sativa*

This is based on: 1. The number of bivalents in the interspecific hybrids

2. Chiasma frequency close to that of the parent with the lower 2n

3. Partial fertility of the relevant hybrids

In situ hybridization *of A. sativa* chromosomes with genomic DNA of *A. strigosa* and *A. clauda*



The inadequacy of in situ hybridization to determine the progenitors of the polyploid oat species

The in situ hybridization is based on: .1 repetitive DNA sequences that could shed specific sequences that may be more critical in speciation.

2. Original and modified A and C genome species can not be separated from each other

The A genome group

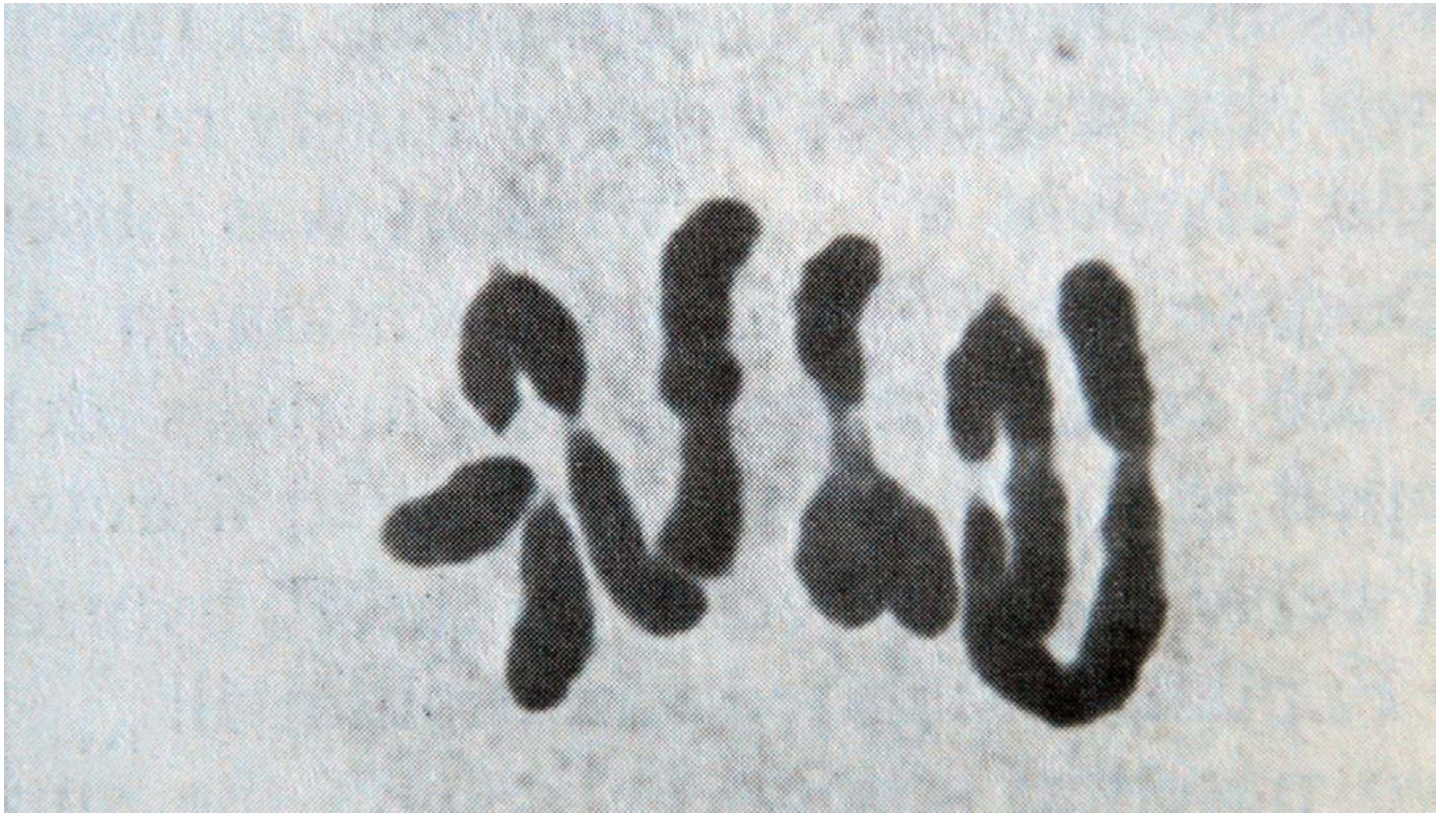
Original: *A. strigosa* and its wild forms •

Modified*: A. longiglumis, A. prostrata, A.* •

damascena, A. canariensis. •

- Each species in this group differs from other species by a number of chromosomal rearrangements

MI in *A. strigosa x A. longiglumis*



Oat species discovered in the last 50 years

Diploids: *A. canariensis, A. prostrata, A. damascena*

Tetraploids: *A. magna, A. murphyi, A. agadiriana, A. insularis*

How the new oat species were discovered

- Survey of herbarium material, *A. canariensis*, *A. agadiriana*
- Accidental, *A. magna, A. damascena*
- Ecological minded exploration, *A. prostrata, A. murphyi, A. insularis*