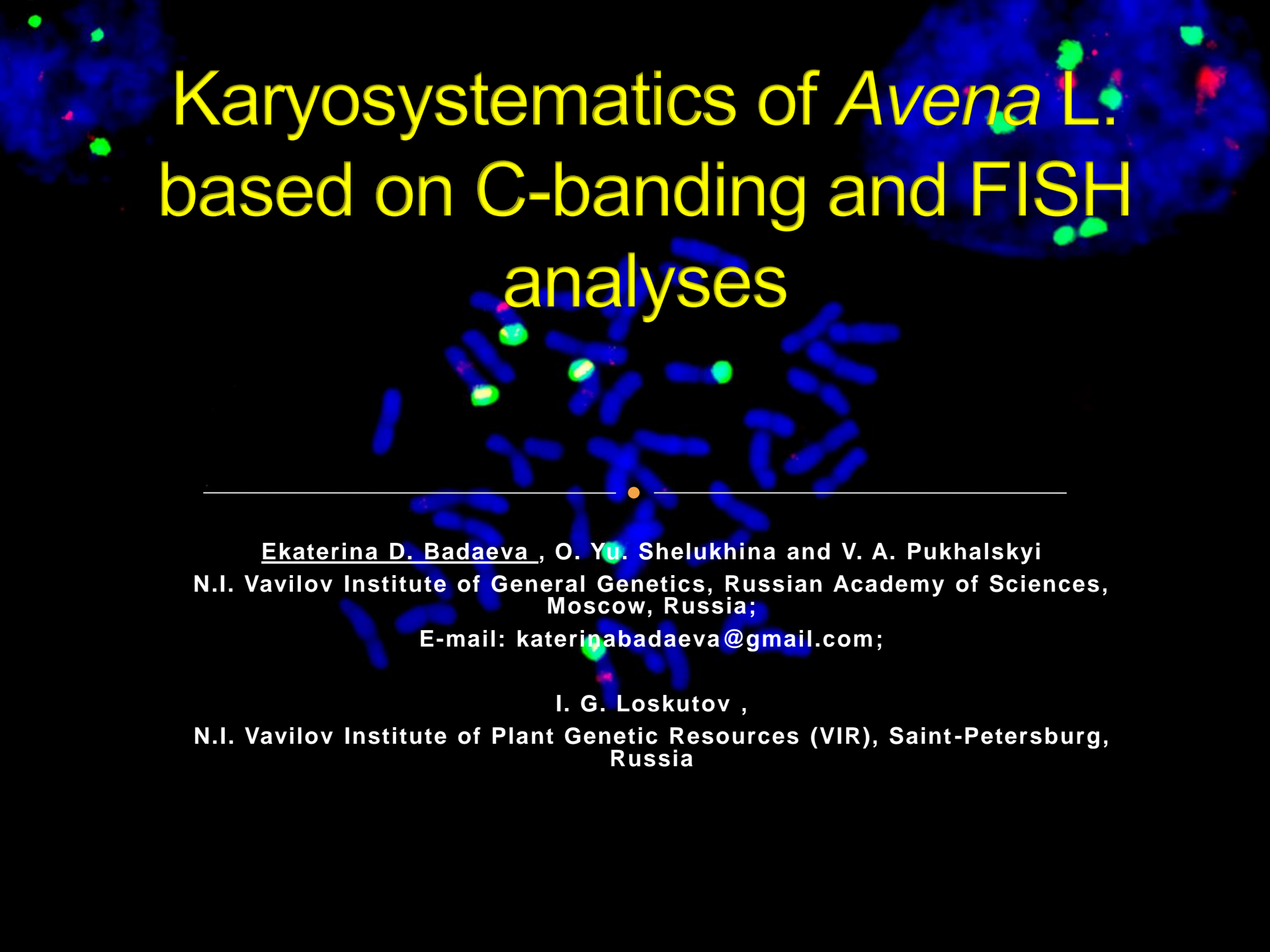


# Karyosystematics of *Avena* L. based on C-banding and FISH analyses



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Russia

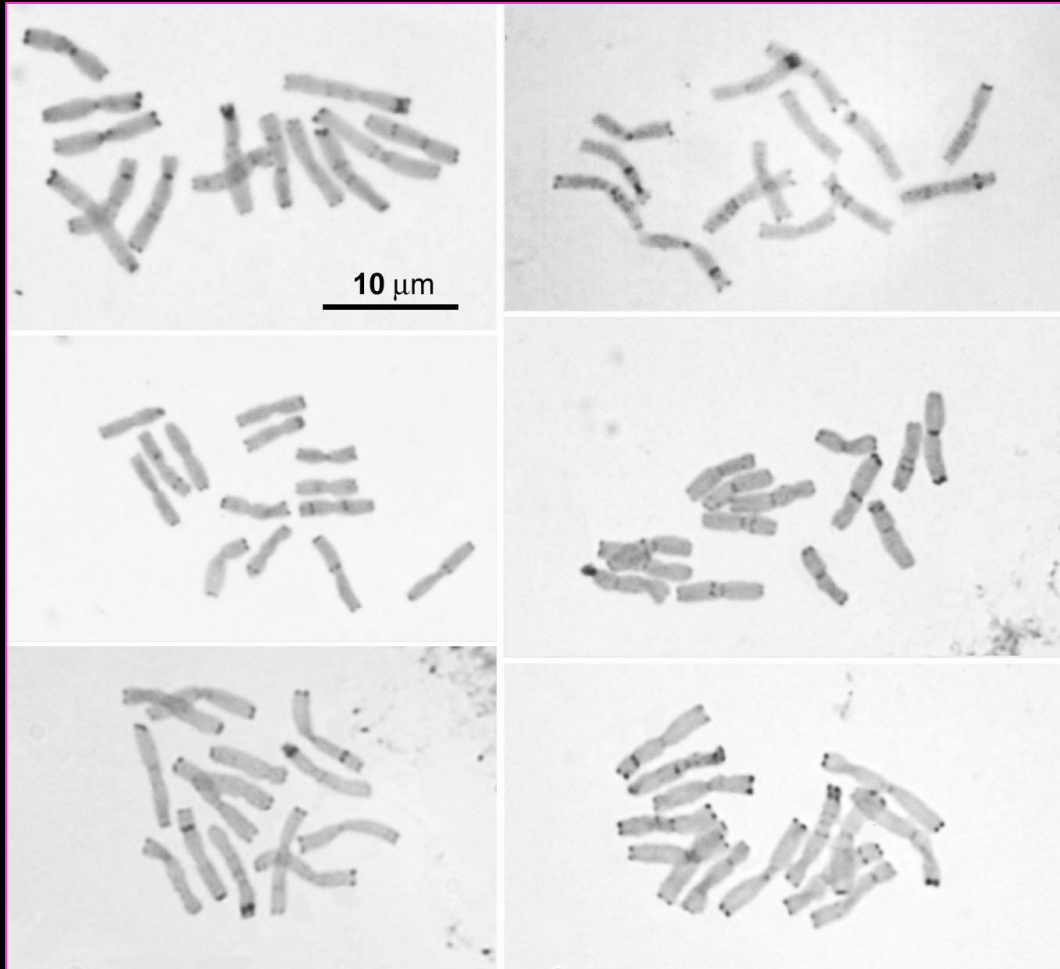
# Taxonomy of *Avena* (Loskutov, 2003)



Section	Species		Genome	2n	
	wild				cultivated
	Disarticulation of florets	Disarticulation of spikelets			
Aristulatae (Malz.) Losk. comb. nov.	A. clauda Dur.	A. pilosa M.B.		14	
	A. longiglumis Dur.				
	A. damascena Rajh. et Baum				
	A. prostrata Ladiz.				
	A. wiestii Steud.	A. atlantica Baum	A. strigosa Schreb.	As	28
	A. hirtula Lagas.				
	A. barbata Pott.		A. abyssinica Hochst.	AB	
	A. vaviliviana Mordv.				
Avenae(L.) Losk. comb. nov.		A. ventricosa Balan.		14	
		A. bruhnsiana Grun.			Cv
		A. canariensis Baum.			Ac
		A. agadiriana Baum et Fed.		AB	28
		A. magna Murphy et Terr.		AC	
		A. murphyi Ladiz.		CD ?	
	A. insularis Ladiz.			42	
	A. fatua L.	A. sterilis L.	A. byzantina C. Koch.		
	A. occidentalis Dur.	A. ludoviciana Dur.	A. sativa L.	ACD	

# Diploid oats (the A-genome group)

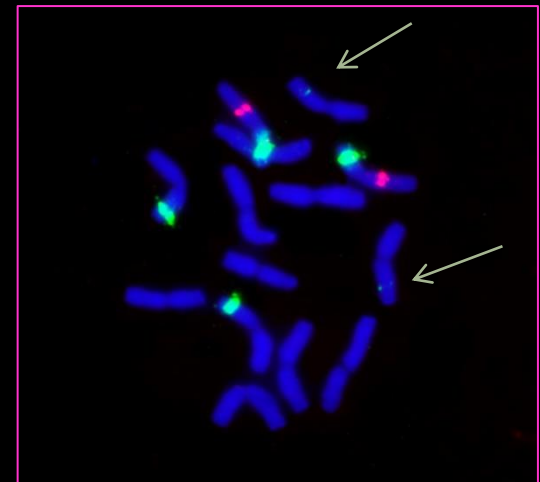
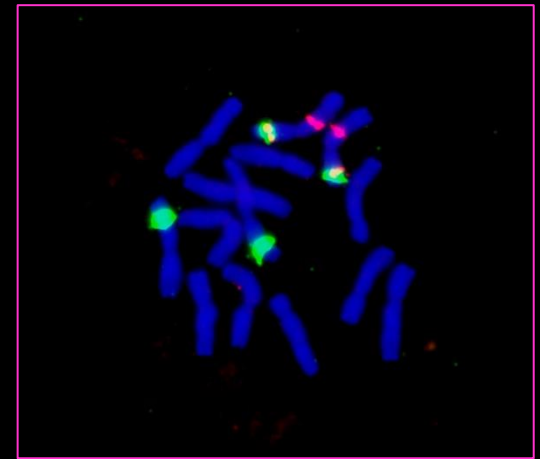
Comparison of the C-banding patterns on chromosomes of diploid A-genome *Avena* species



*A. strigosa*  
*A. longiglumis*  
*A. wiestii*

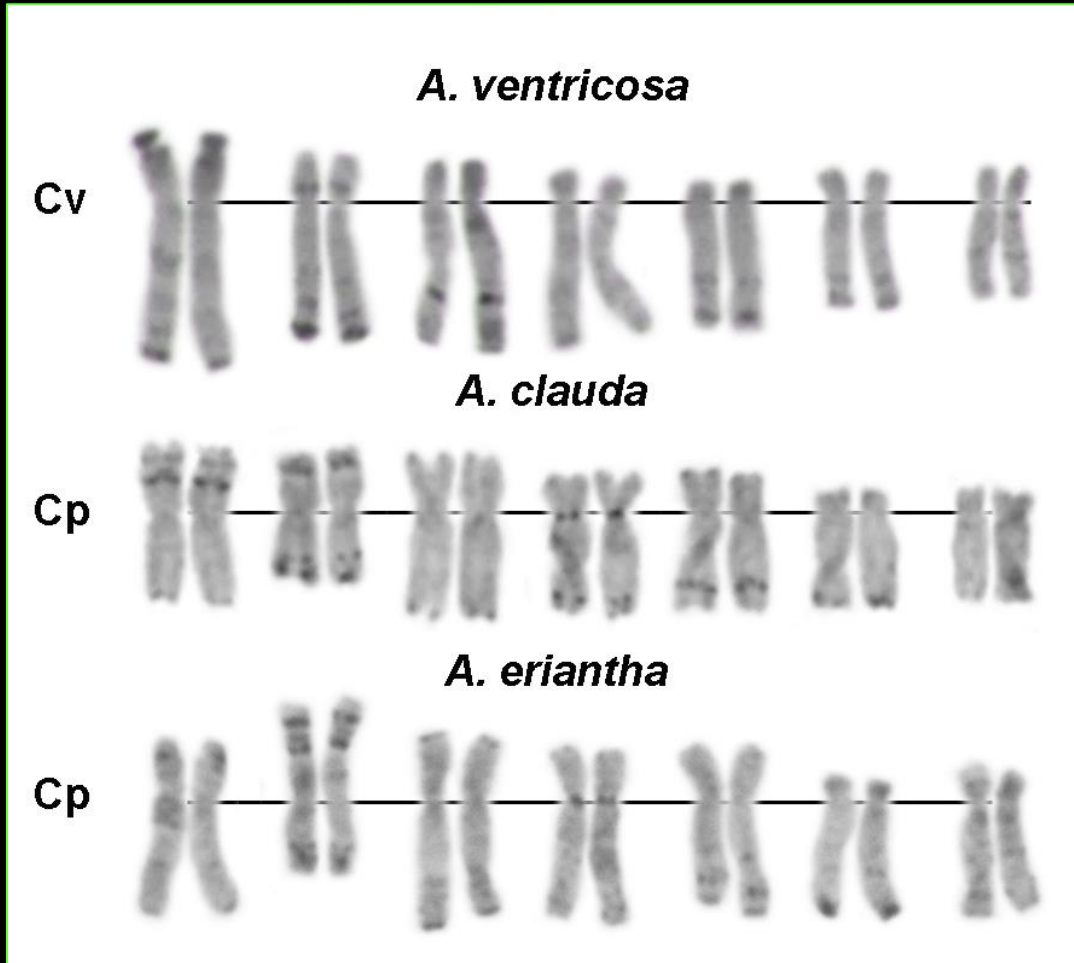
*A. damascena*  
*A. canariensis*  
*A. hirtula*

FISH with 5S and 45S rDNA probes on chromosomes of *A. strigosa* and *A. damascena*

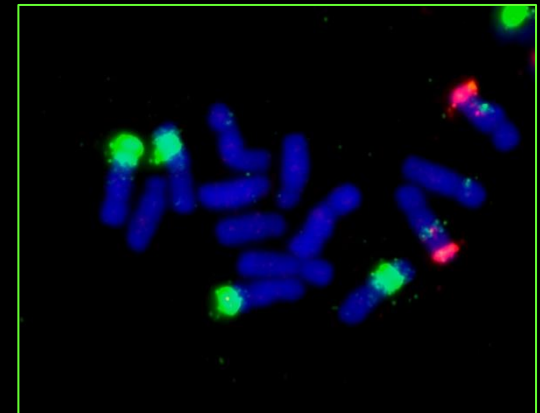
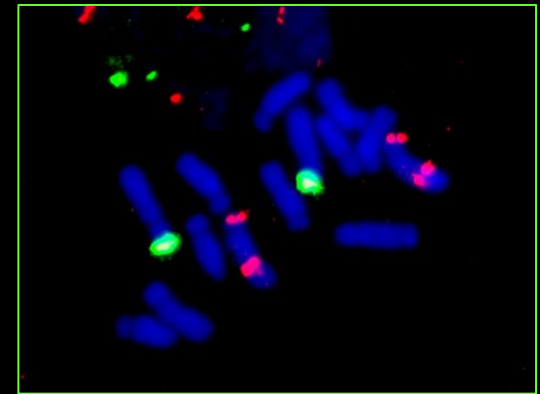


# Diploid oats (the C-genome group)

Comparison of the C-banding patterns on chromosomes of diploid C-genome *Avena* species

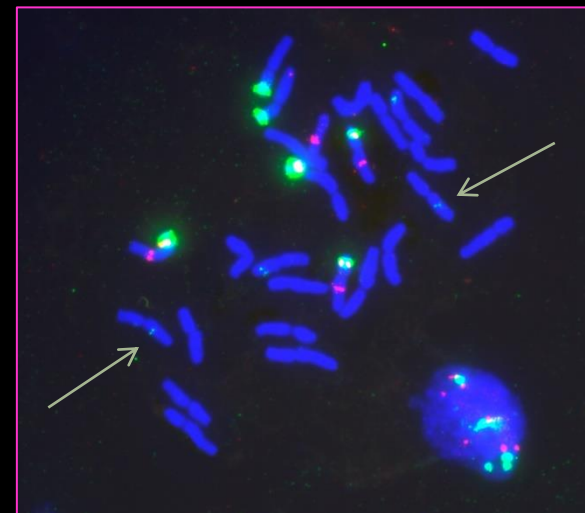
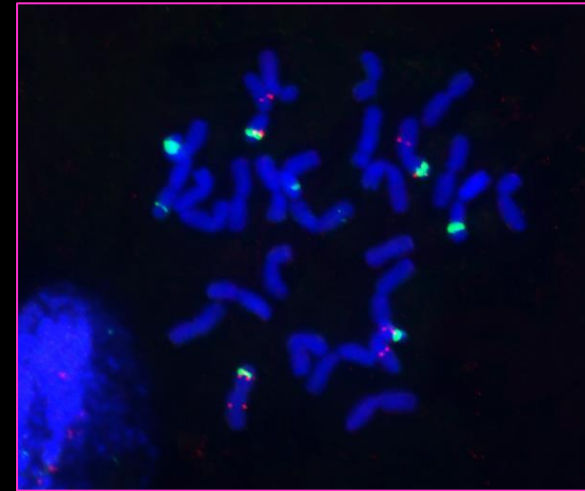
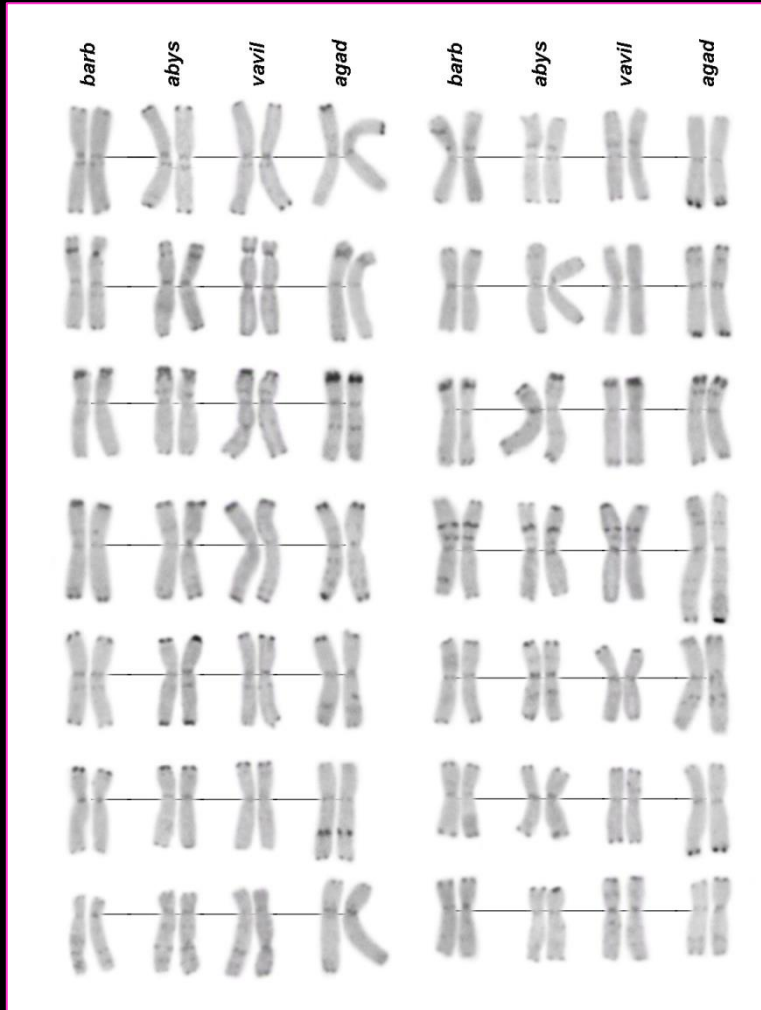


FISH with 5S and 45S rDNA probes on chromosomes of *A. ventricosa* and *A. clauda*



# Tetraploid oats (the AB-genome group)

Comparison of the C-banding patterns on chromosomes of tetraploid AB-genome *Avena* species: barb – *A. barbata*; abys – *A. abyssinica*; vavil – *A. vaviloviana*; agad – *A. agadiriana*

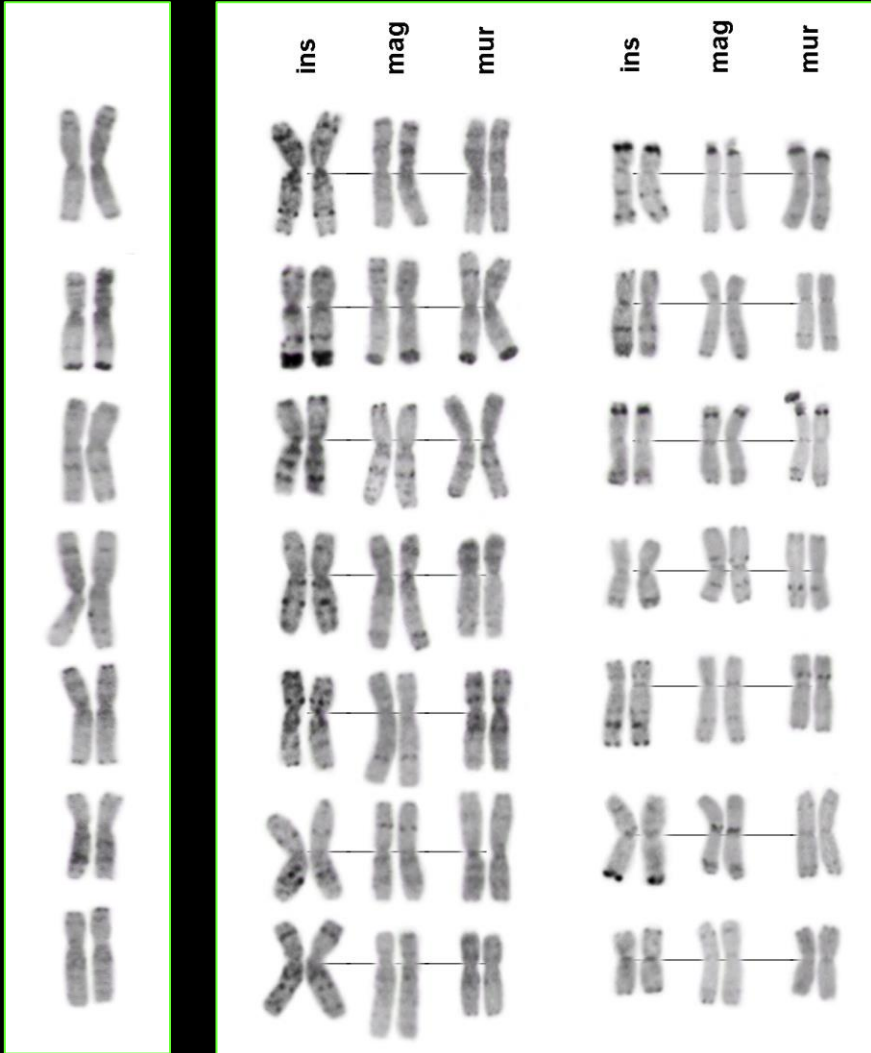


FISH with 5S and 45S rDNA probes on chromosomes of *A. barbata* and *A. agadiriana*

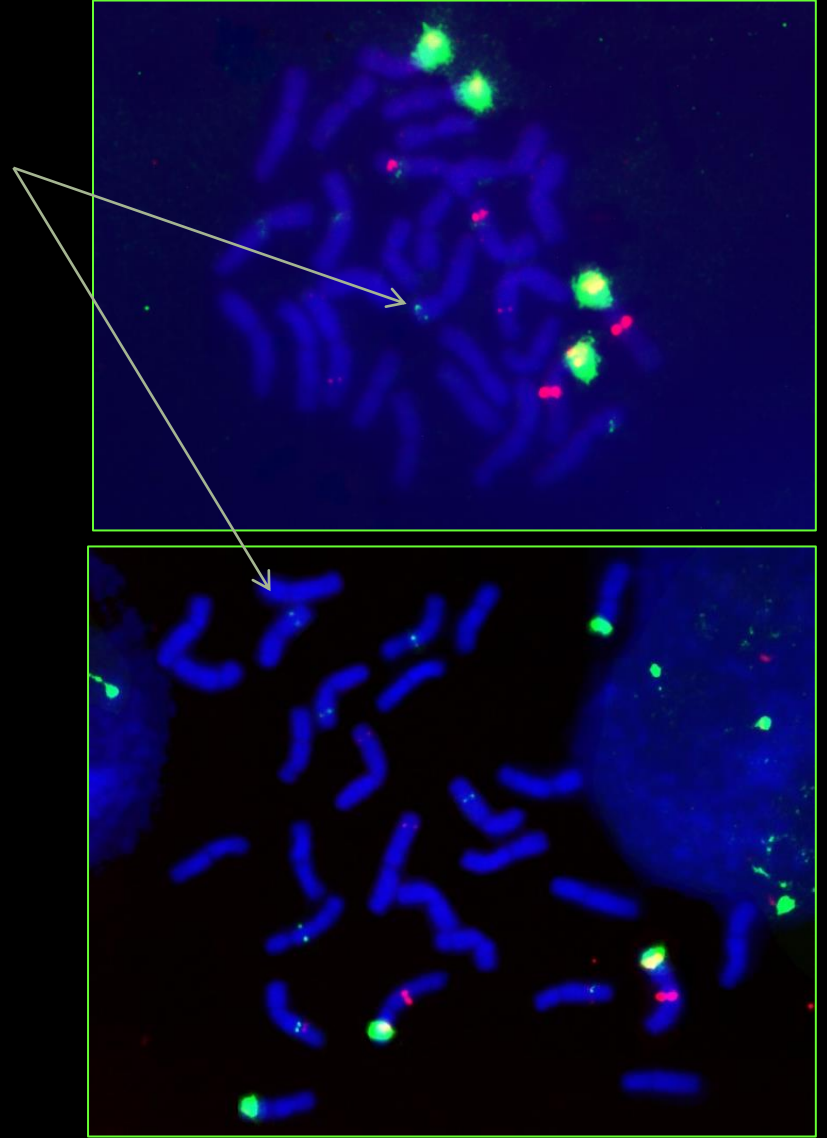
C-genome of  
*A. ludoviciana*

## Tetraploid oats (the CD-genome group)

Comparison of the C-banding patterns on chromosomes of tetraploid CD-genome *Avena* species: ins – *A. insularis*; mag – *A. magna*; mur – *A. murphyi*



FISH with 5S and 45S rDNA probes on chromosomes of *A. murphyi* and *insularis*

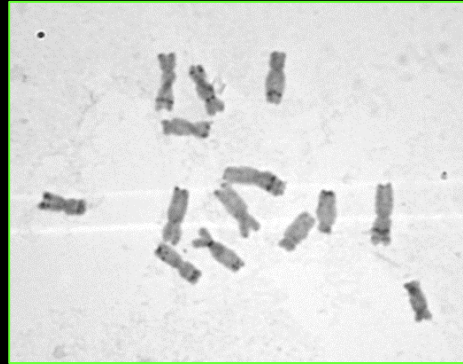


# Avena macrostachya (the CC-genome tetraploid species)

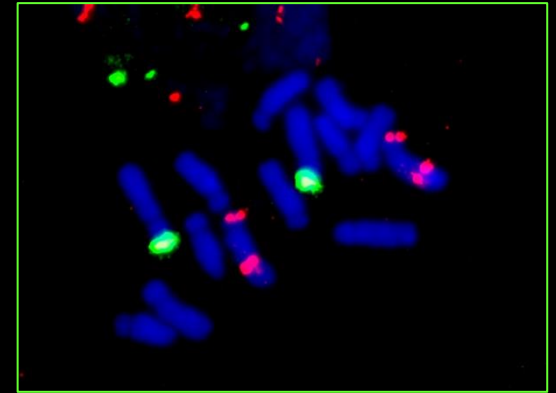
*A. ventricosa*



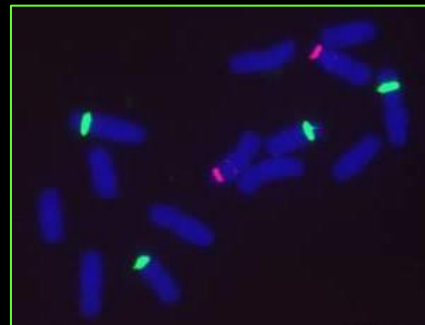
*A. clauda*



*A. ventricosa*

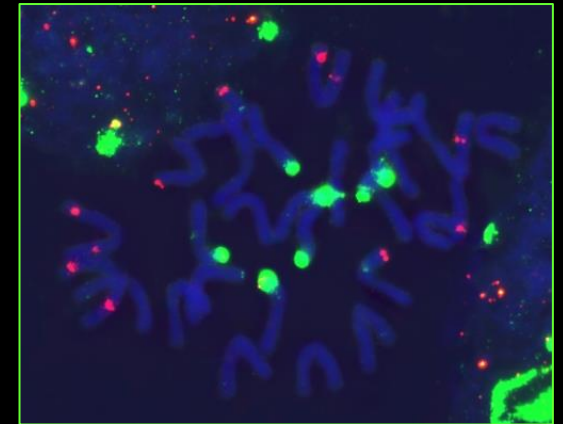


*A. clauda*



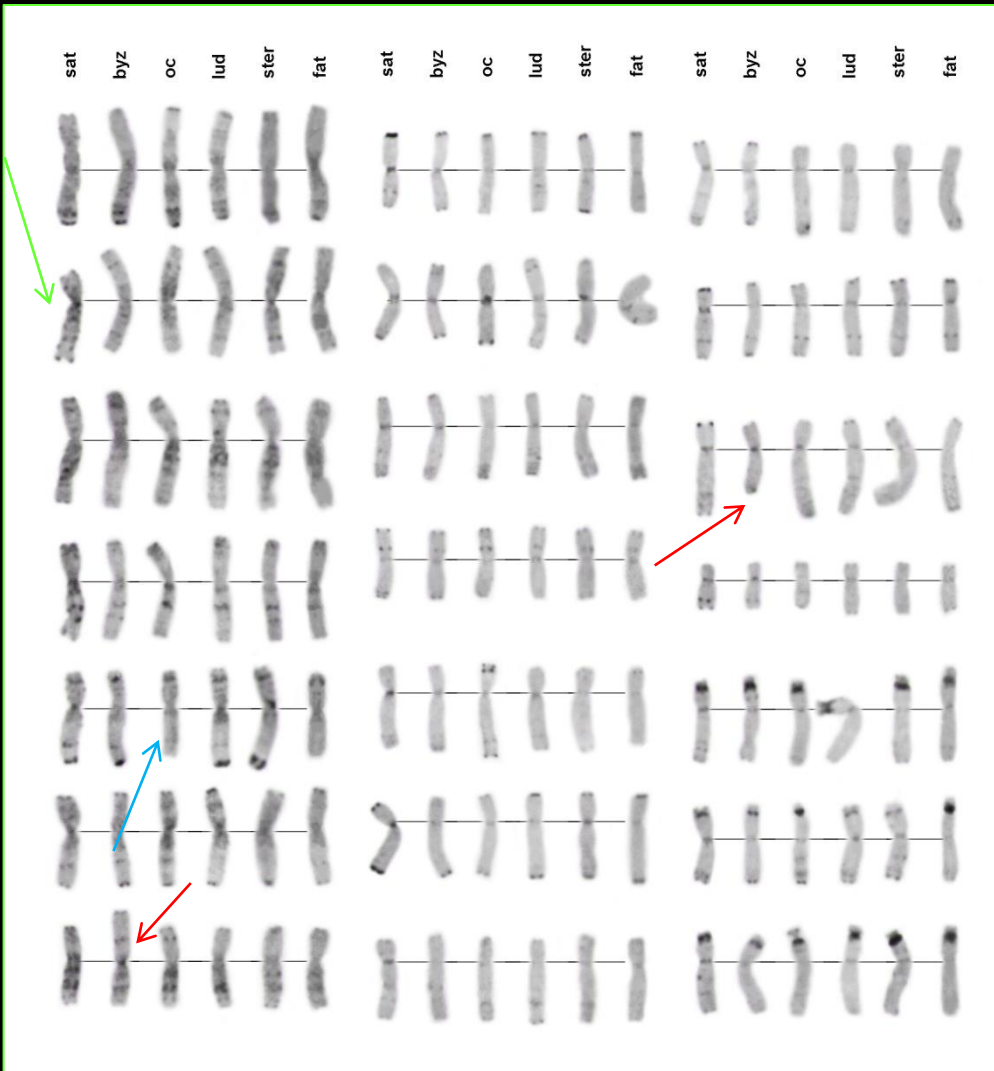
FISH with 5S and 45S rDNA probes on chromosomes of *A. macrostachya*.

Metaphase cell and karyotype of *A. macrostachya*, an autopolyploid oat species with CC-genome constitution.

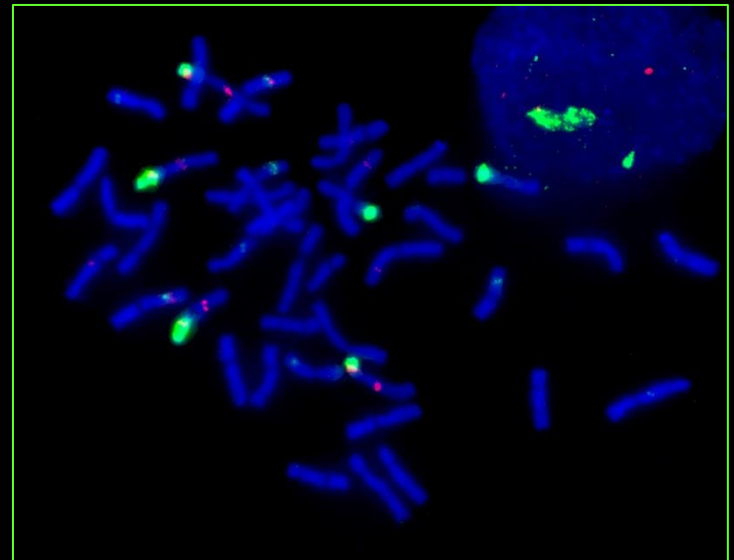


# Hexaploid oats (the ACD-genome group)

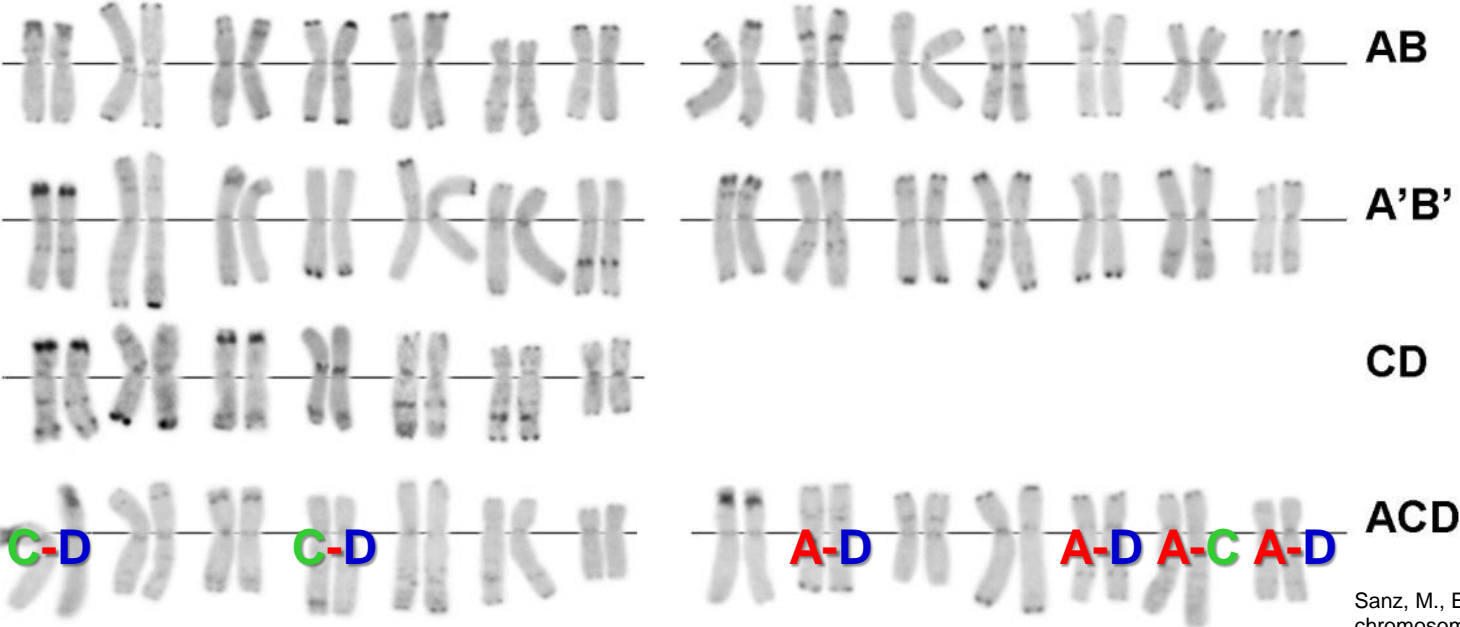
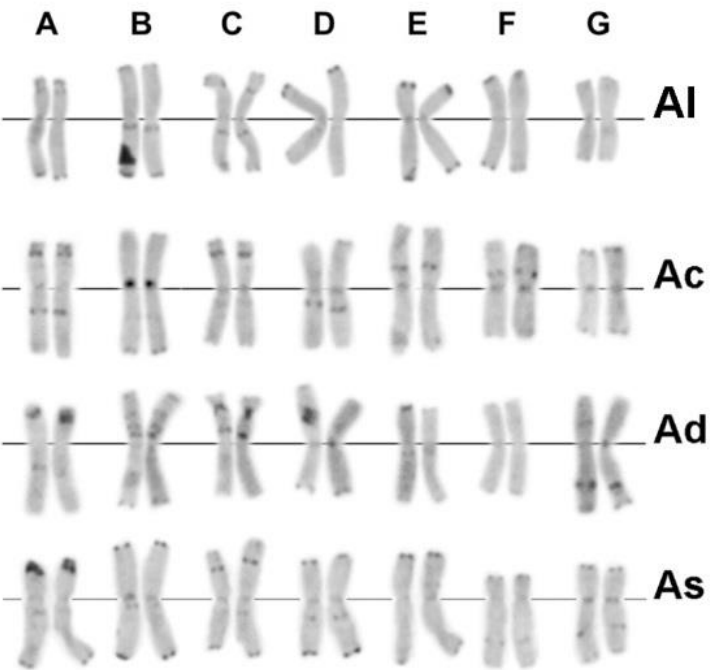
Comparison of the C-banding patterns on chromosomes of hexaploid ACD-genome *Avena* species: sat – *A. sativa*; byz – *A. byzantina*; oc – *A. occidentalis*; lud – *A. ludoviciana*; ster – *A. sterilis*; fat – *A. fatua*.



FISH with 5S and 45S rDNA probes on chromosomes of *A. sativa*







**XXI**   **IX**   **XX**   **XII**   **X**   **XIV**   **XVIII**   **XIX**   **VIII**   **XI**   **XIII**   **XVI**   **XVII**   **XV**  
**13D**   **17D**   **3D**   **9D**   **11D**   **14D**   **21D**   **12A**   **8A**   **6A**   **20A**   **19A**   **5A**   **18A**

Sanz, M., E. Jellen, Y. Loarce, M. et al. (2010). "A new chromosome nomenclature system for oat (*Avena sativa* L. and *A. byzantina* C. Koch) based on FISH analysis of monosomic lines." Theor App Genet 121(8): 1541-1552.

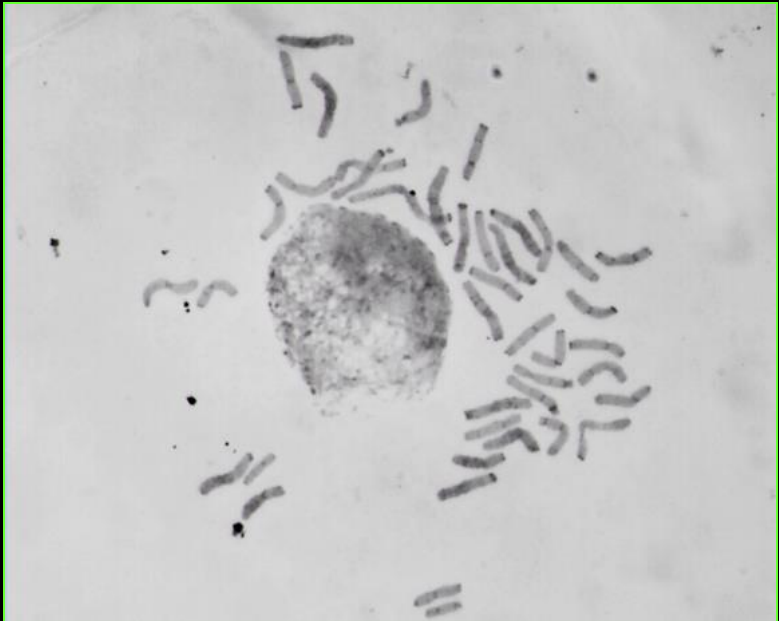


Diploid oats

A-genome

C-genome

ACD-genome hexaploid



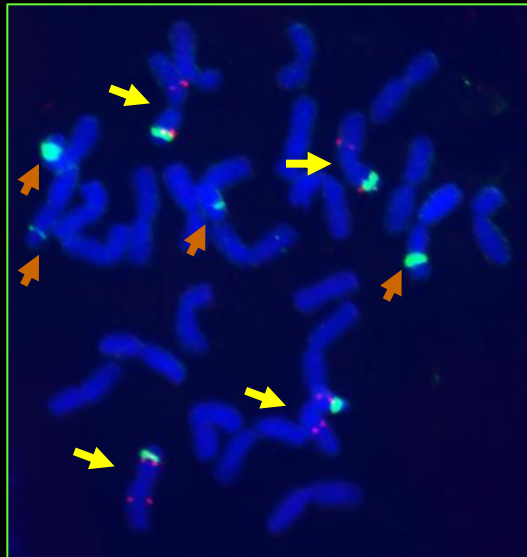
Chromosome modifications

Chromosome modifications

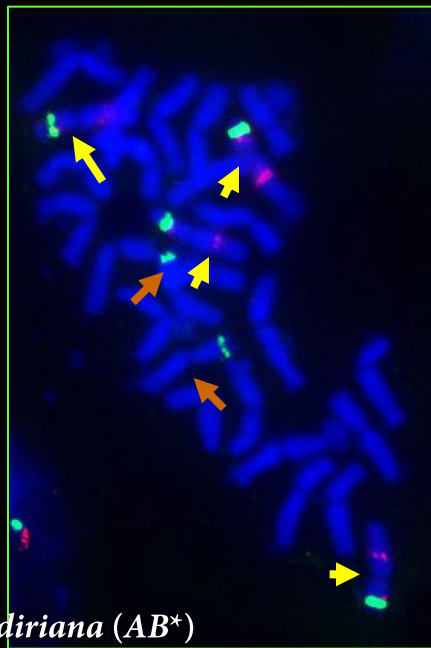
Chromosome modifications

Chromosomal rearrangements

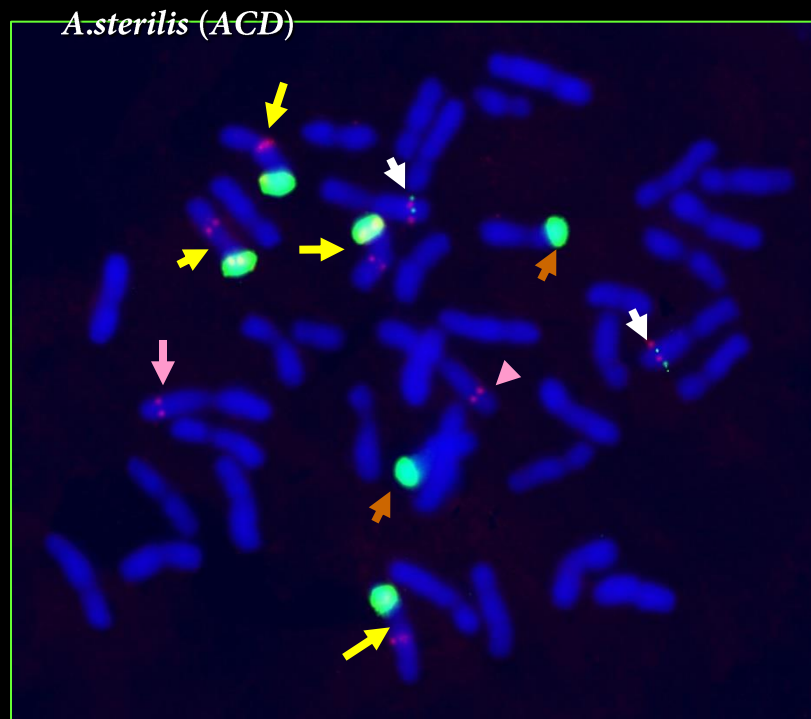
AC-genome tetraploid



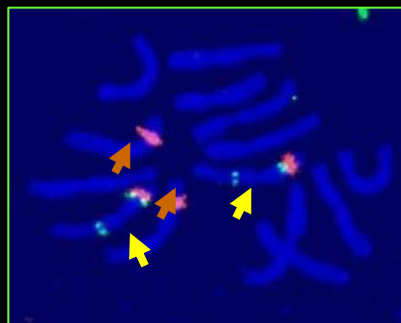
*A. barbata* (AB)



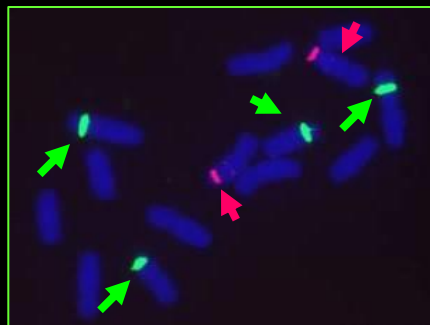
*A. agadiriana* (AB\*)



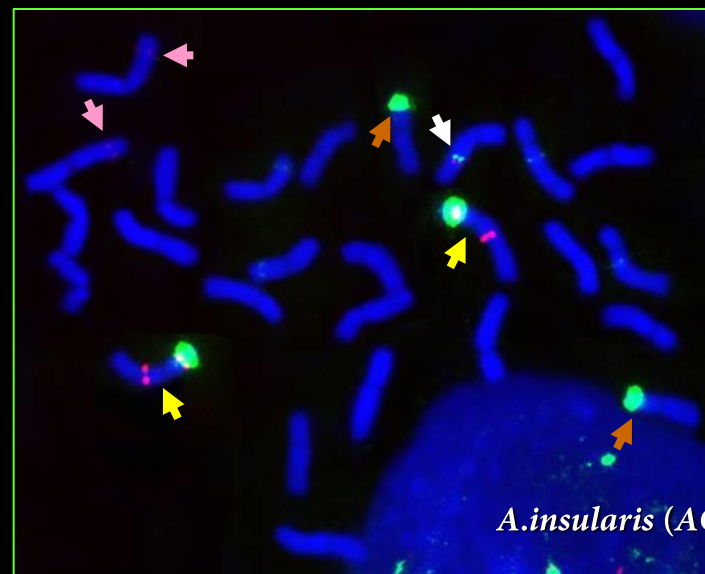
*A. sterilis* (ACD)



*A. wiestii* (A)



*A. clauda* (C)

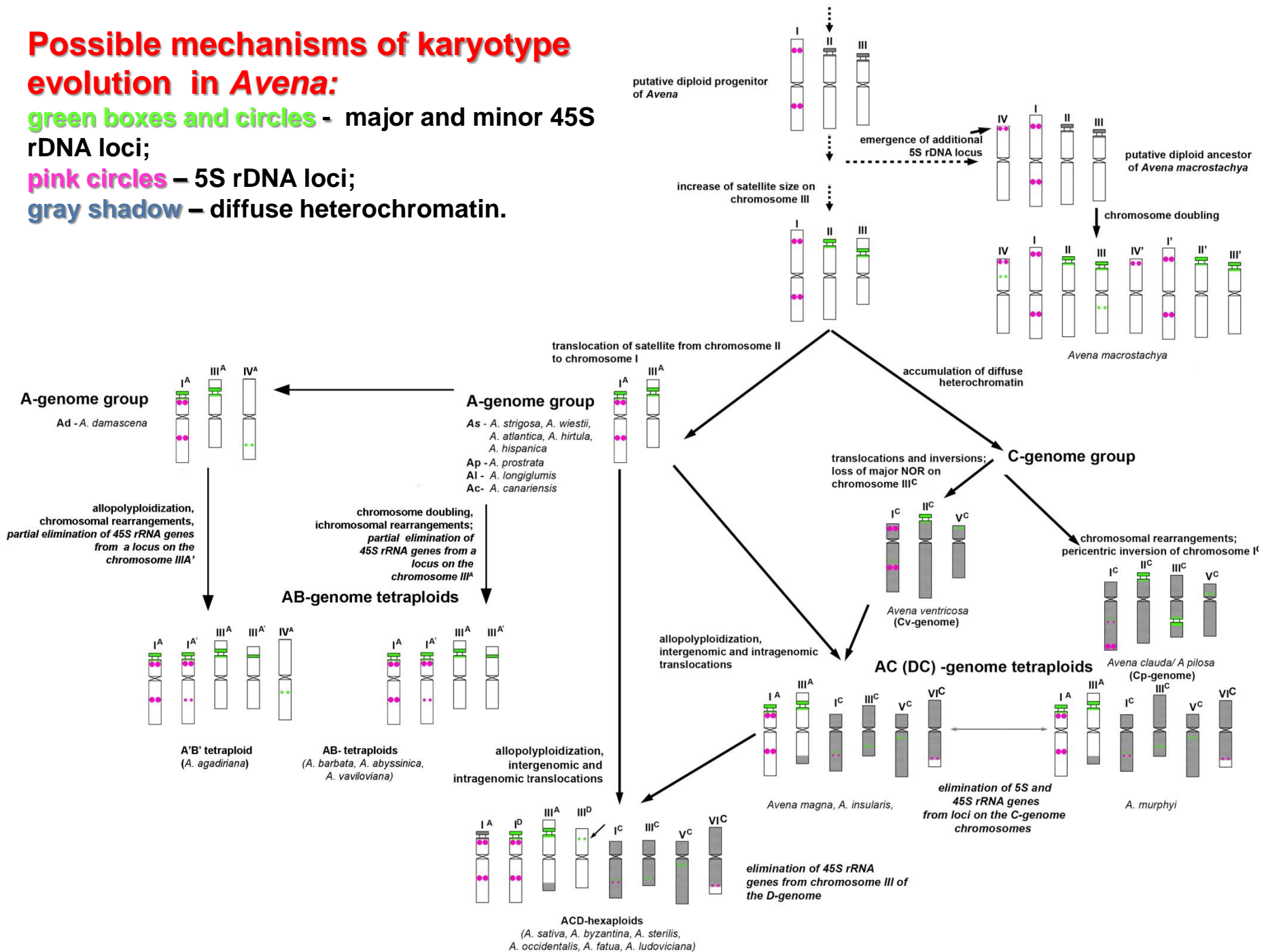



*A. insularis* (AC)

# Possible mechanisms of karyotype evolution in *Avena*:

green boxes and circles - major and minor 45S rDNA loci;  
pink circles - 5S rDNA loci;

gray shadow - diffuse heterochromatin.



The image shows a field of oat plants in the foreground, with a stone wall in the background. The text is overlaid on the image.

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**Dedkova Olga S. – Post-Doc of the Vavilov Institute of General Genetics, Moscow, Russia**

**Loskutov Igor – Curator of oat collection in the Vavilov Institute of Plant Industry, Saint-Petersburg, Russia;**

**Diederichsen Axel, Plant Gene Resources of Canada, Agriculture and Agri-Food Canada**

**Thank you for your attention!**