A close look at the *Avena ventricosa* populations of Cyprus

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Stella Constantinou, and

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Agricultural Research Institute

An Integrated European *In Situ* Management Workplan: Implementing Genetic Reserves and On Farm Concepts (AEGRO)

WP 8 Case study *Avena*

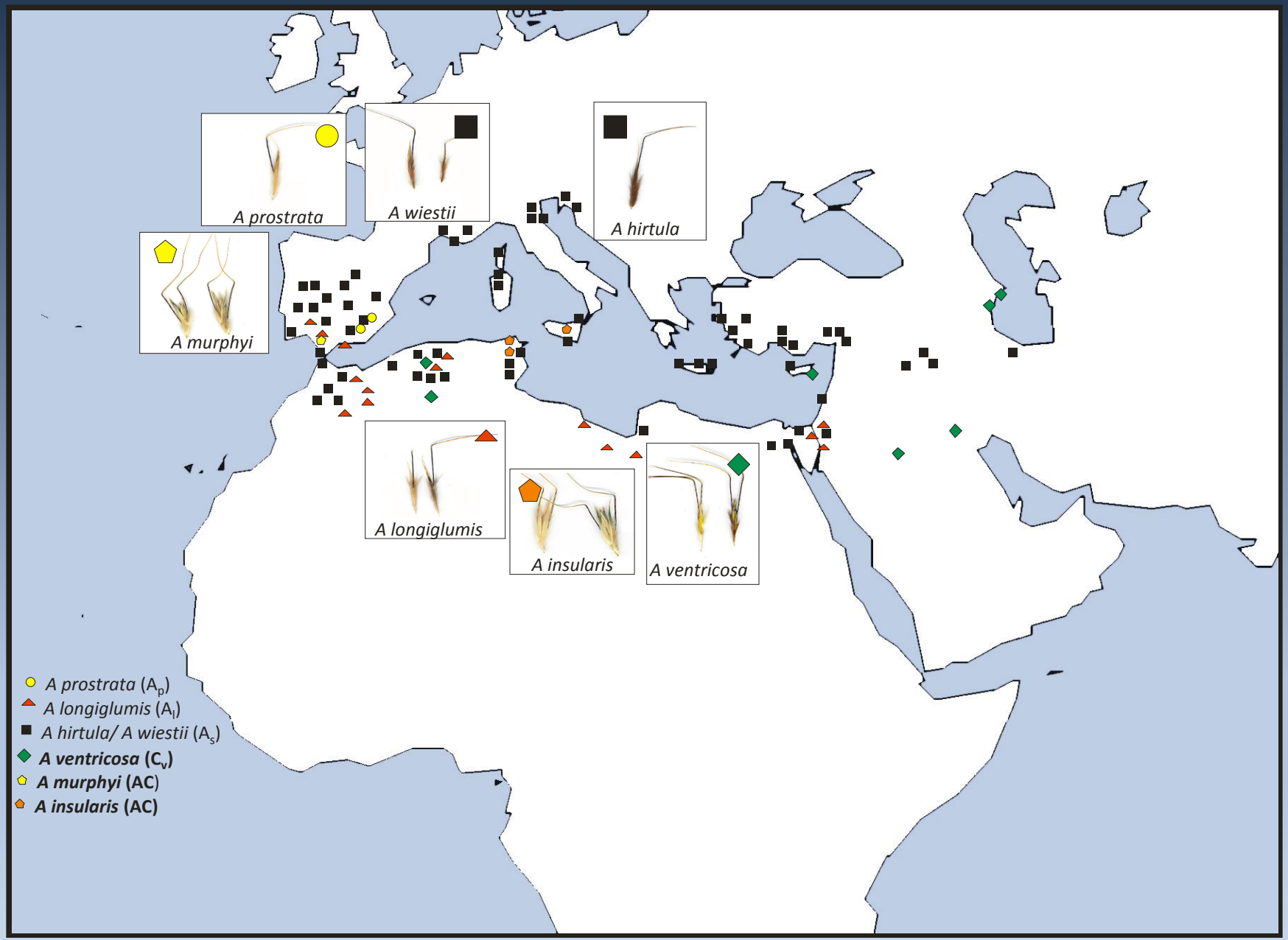
Prioritize species and populations, identify sites suited to establish genetic reserves and develop guidelines for genetic reserves design, management and monitoring.

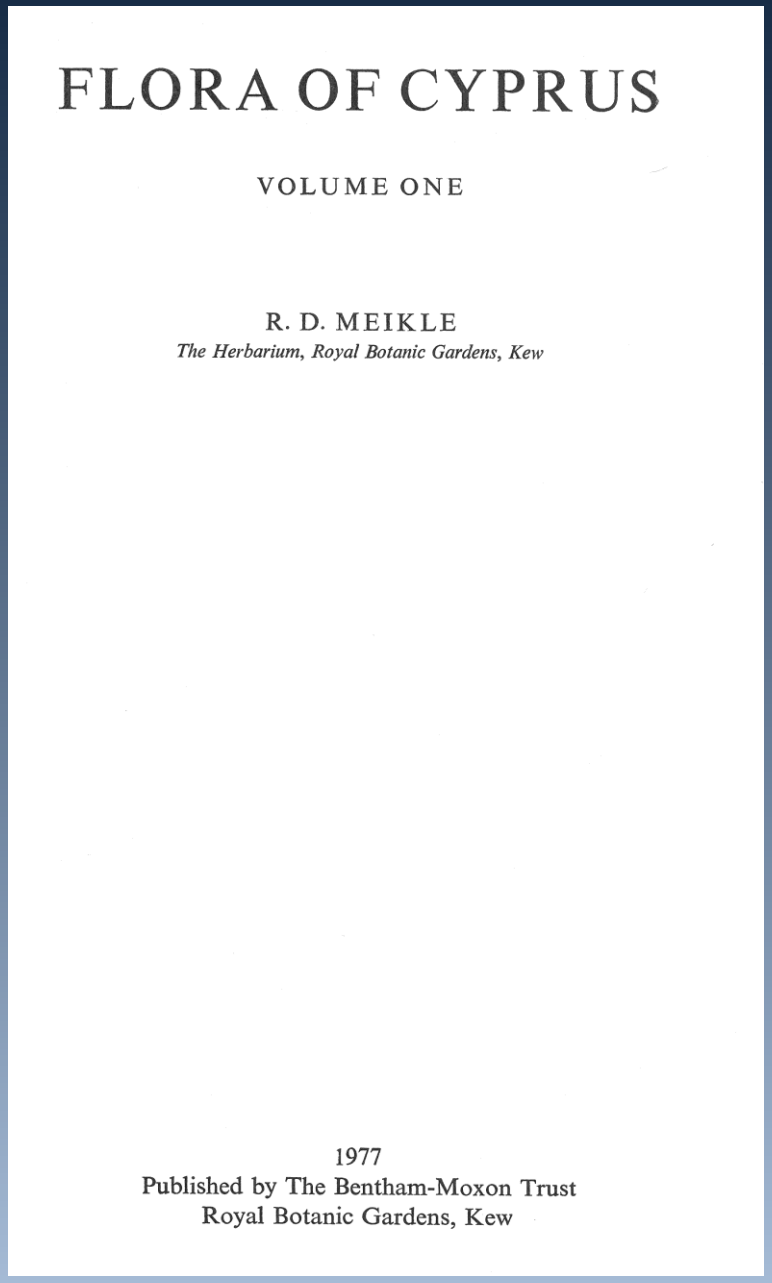
Mike Leggett, Christoph Germeier, Pedro Garcia, Igor Loskutov and Gideon Ladizinsky

Avena ventricosa accessions present in germplasm banks

EURISCO: 10 (Cyprus) - 1 (Germany/Cyprus) – 1 (Italy/Cyprus) – 3 (UK/?/Algeria/f.USSR)
GRIN-USDA: 3 (Morocco, but 2 not available)
GRIN-CA: 4 (Azerbaijan)

Geographic distribution of prioritized *Avena* species





FLORA OF CYPRUS

VOLUME ONE

R. D. MEIKLE
The Herbarium, Royal Botanic Gardens, Kew

1977
Published by The Bentham-Moxon Trust
Royal Botanic Gardens, Kew

Flora of Cyprus

Diploid species

1. *Avena ventricosa*
2. *Avena eriantha*
3. *Avena clauda*
4. *Avena wiestii*
5. *Avena hirtula*

Tetraploid species

1. *Avena barbata*
2. *Avena wiestii (?)*

Hexaploid species

1. *Avena ludoviciana*
2. *Avena sterilis*
3. *Avena byzantina*

1/2 **unequal glumes** 2/3

Avena eriantha / clauda

Avena ventricosa

Why *Avena ventricosa* is considered an important species?

Avena ventricosa: Possible Diploid Contributor to Hexaploid Oats

GIDEON LADIZINSKY
DANIEL ZOHARY
Department of Botany, Hebrew University, Jerusalem, Israel

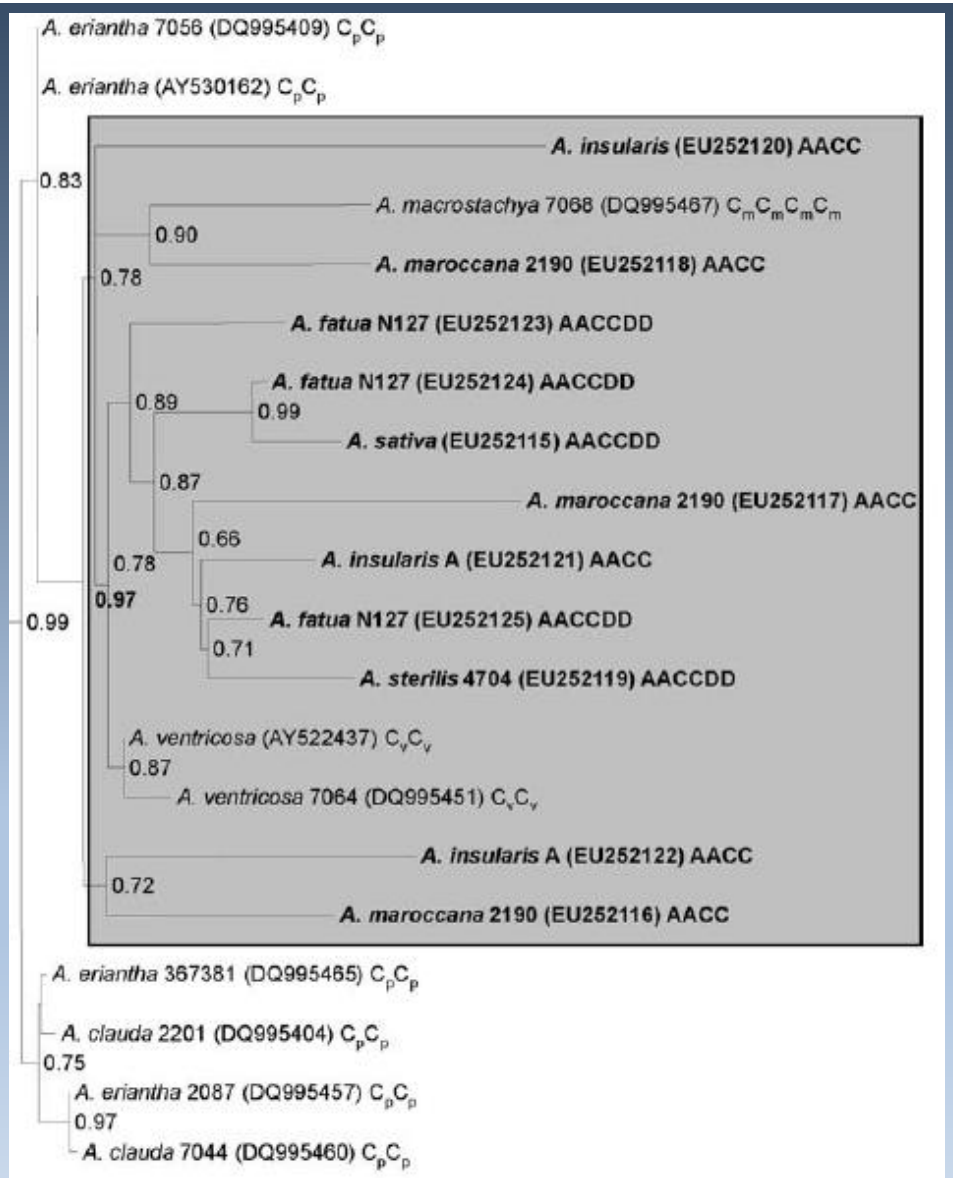
SCIENCE, VOL. 155
12 January 1967

The origin of the C-genome and cytoplasm of *Avena* polyploids

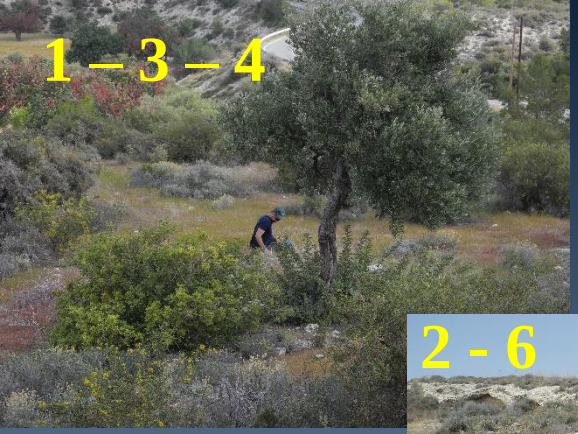
N. Nikoloudakis · A. Katsiotis

Theor Appl Genet (2008) 117:273–281

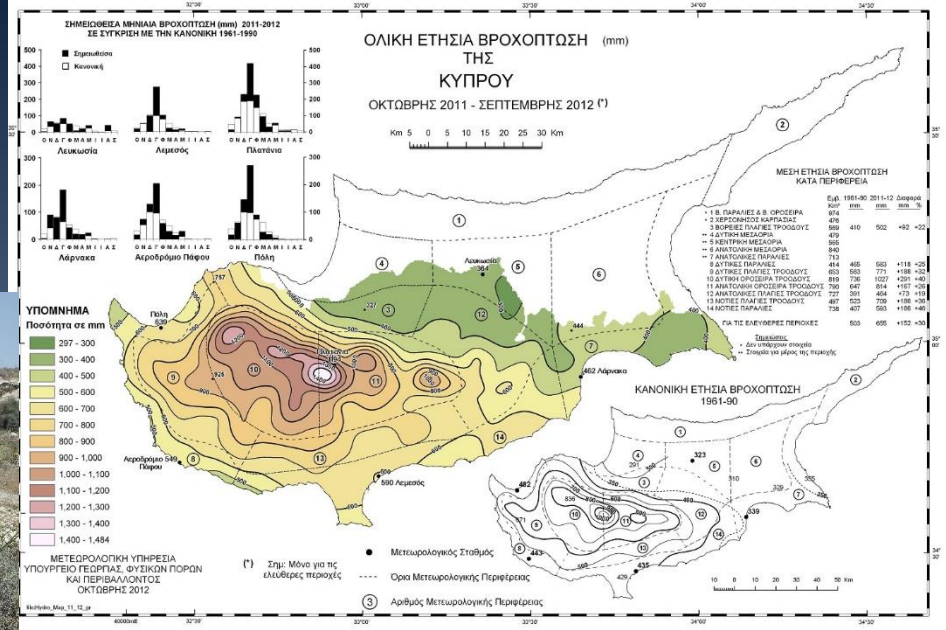
ITS1-5.8S-ITS2
sequences



Assessing the genetic diversity of *Avena ventricosa* populations in Cyprus using molecular markers


1 – 3 – 4

2 - 6


ΣΗΜΕΙΩΘΕΙΣΑ ΜΗΝΙΑΙΑ ΒΡΟΧΟΠΤΩΣΗ (mm) 2011-2012
ΣΕ ΣΥΓΚΡΙΣΗ ΜΕ ΤΗΝ ΚΑΝΟΝΙΚΗ 1961-1990
Σημειωθείσα
Κανονική
Λευκωσία
Λεμεσός
Πλατάνια
Λάρνακα
Αεροδρόμιο Πάφου
Πόλη
ΟΛΙΚΗ ΕΤΗΣΙΑ ΒΡΟΧΟΠΤΩΣΗ (mm)
ΤΗΣ
ΚΥΠΡΟΥ
ΟΚΤΩΒΡΗΣ 2011 - ΣΕΠΤΕΜΒΡΗΣ 2012 (*)
ΜΕΣΗ ΕΤΗΣΙΑ ΒΡΟΧΟΠΤΩΣΗ
ΚΑΤΑ ΠΕΡΙΦΕΡΕΙΑ
ΥΠΟΜΝΗΜΑ
Ποσότητα σε mm
297 - 300
300 - 400
400 - 500
500 - 600
600 - 700
700 - 800
800 - 900
900 - 1,000
1,000 - 1,100
1,100 - 1,200
1,200 - 1,300
1,300 - 1,400
1,400 - 1,484
ΚΑΝΟΝΙΚΗ ΕΤΗΣΙΑ ΒΡΟΧΟΠΤΩΣΗ
1961-90
462 Λάρνακα
590 Λεμεσός
Αεροδρόμιο 549 Πάφου
Πόλη 520
ΜΕΤΕΩΡΟΛΟΓΙΚΗ ΥΠΗΡΕΣΙΑ
ΥΠΟΥΡΓΕΙΟ ΓΕΩΡΓΙΑΣ, ΦΥΣΙΚΩΝ ΠΟΡΩΝ
ΚΑΙ ΠΕΡΙΒΑΛΛΟΝΤΟΣ
ΟΚΤΩΒΡΗΣ 2012
(*) Σημ: Μόνο για τις ελεύθερες περιοχές
Μετεωρολογικός Σταθμός
Ορια Μετεωρολογικής Περιφέρειας
Αριθμός Μετεωρολογικής Περιφέρειας

2
3
4
6
1
5
Image Landsat
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Google earth
Imagery Date: 12/14/2015 35°07'28.59" N 33°23'05.55" E elev 188 m eye alt 219.11 km

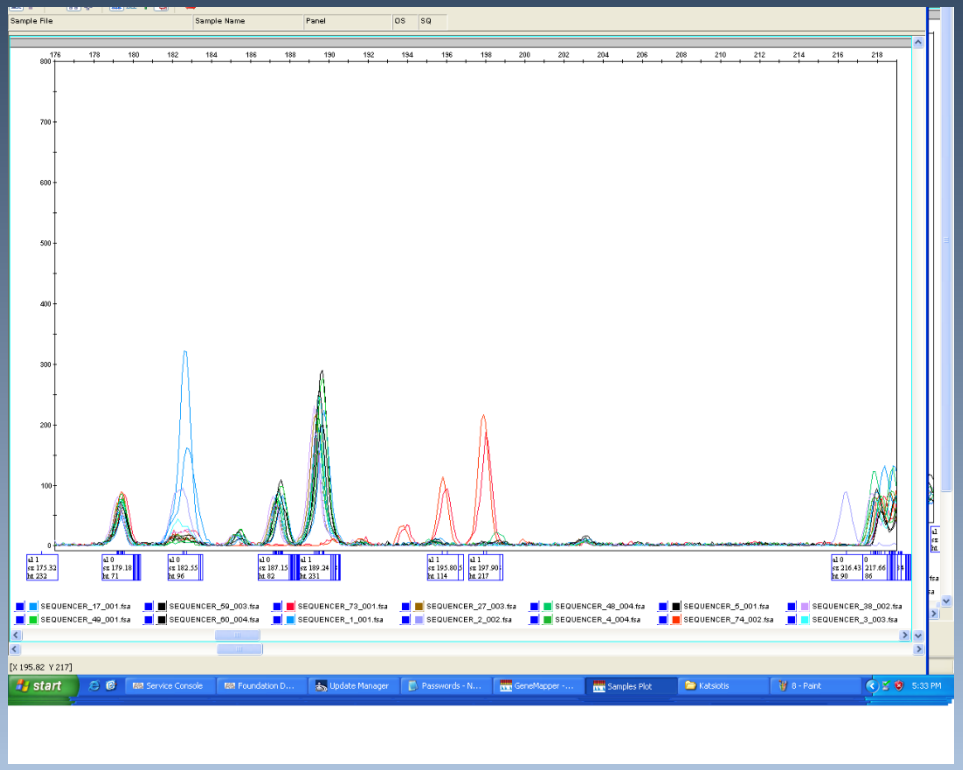
5

Assessing the genetic diversity of *Avena ventricosa* populations in Cyprus using molecular markers

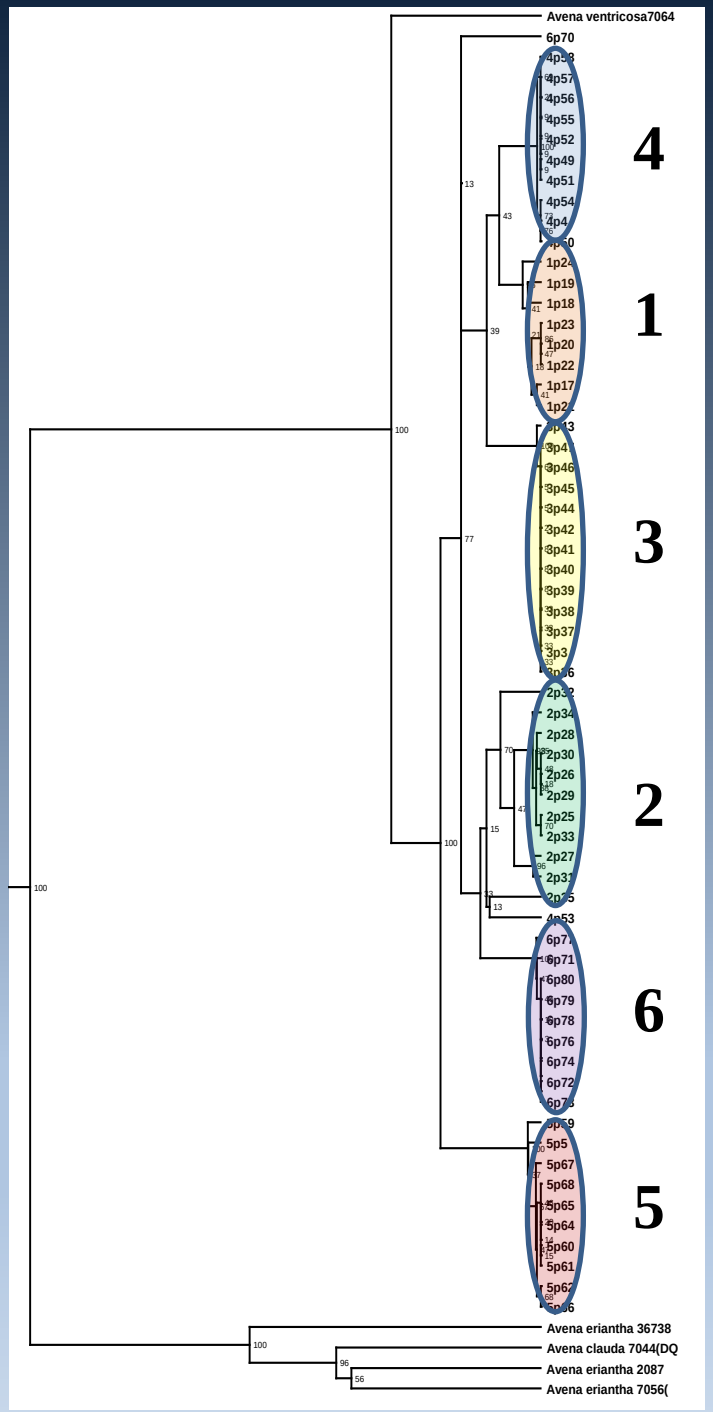
AFLP

			MseI							
EcoRI			CAA	CAC	CAG	CAT	CTA	CTC	CTG	CTT
	NED	AAC	-	-	-	-	-	-	-	-
	NED	ACC	-	-	-	-	-	-	-	-
	NED	AGC	-	-	-	-	-	-	-	-
	JOE	AAG	19	23	19	17	24	7	28	21
	JOE	ACG	10	19	8	7	15	10	10	15
	JOE	AGG	ΔΔ*	ΔΔ*	ΔΔ*	ΔΔ*	ΔΔ*	ΔΔ*	ΔΔ*	ΔΔ*
	FAM	ACT	60**	37**	22	48	38	31	34	41
	FAM	ACA	53	57**	30	51**	49	47	50	53

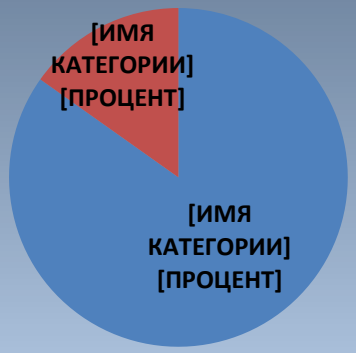
Assessing the genetic diversity of *Avena ventricosa* populations in Cyprus using molecular markers



primers	Total bands	Polymorphic bands
EcoRI ACT/MseI CAC	56	27
EcoRI ACA/MseI CAT	58	16
EcoRI ACA/MseI CAC	69	32
total	183	75



Percentages of Molecular Variance



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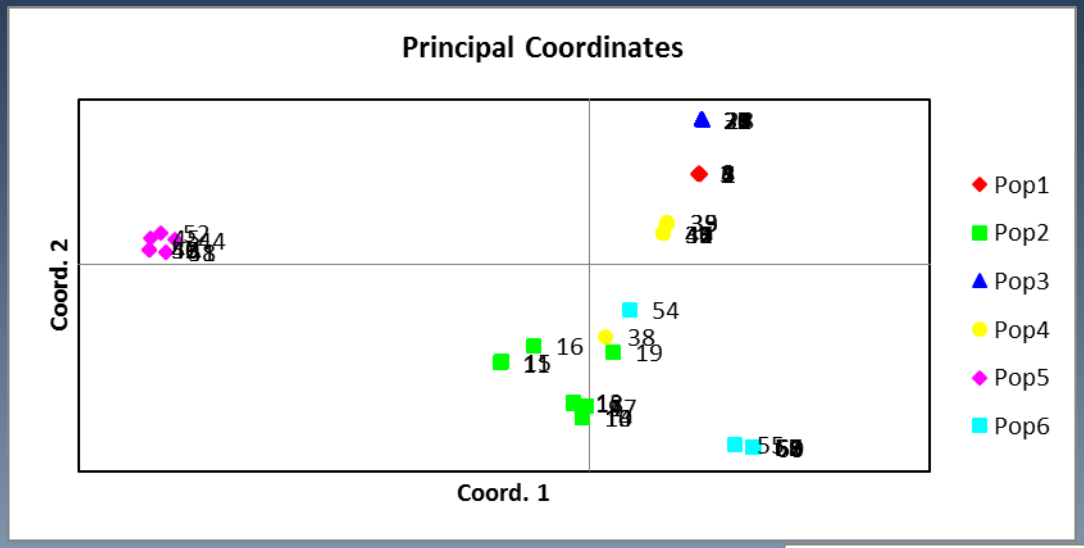
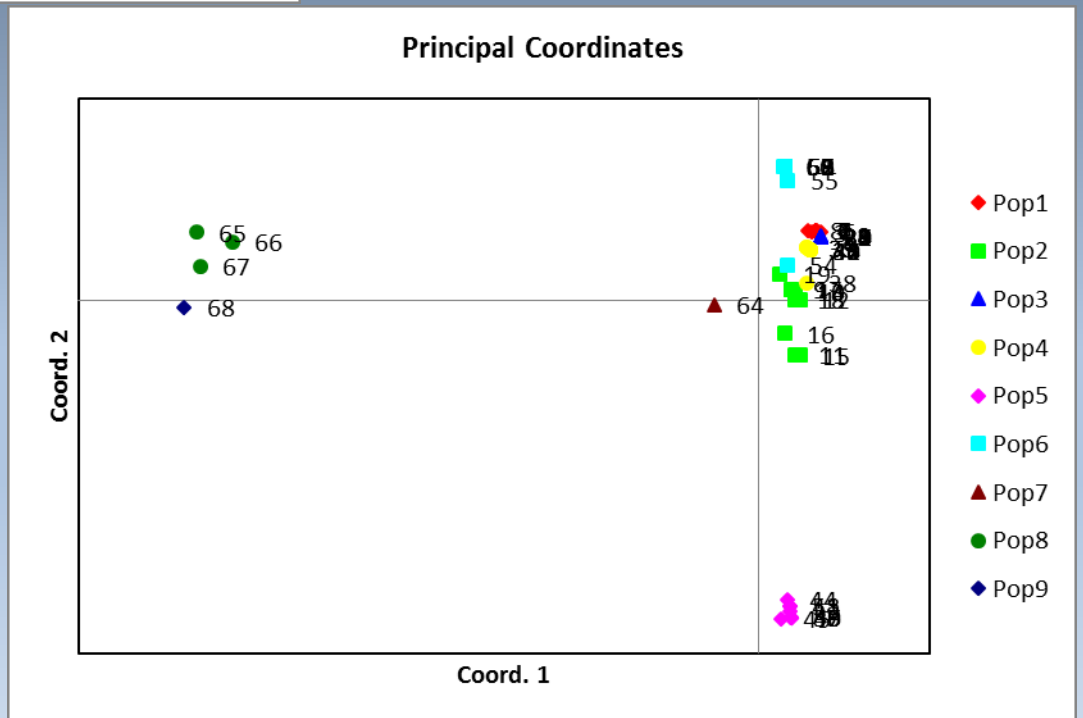




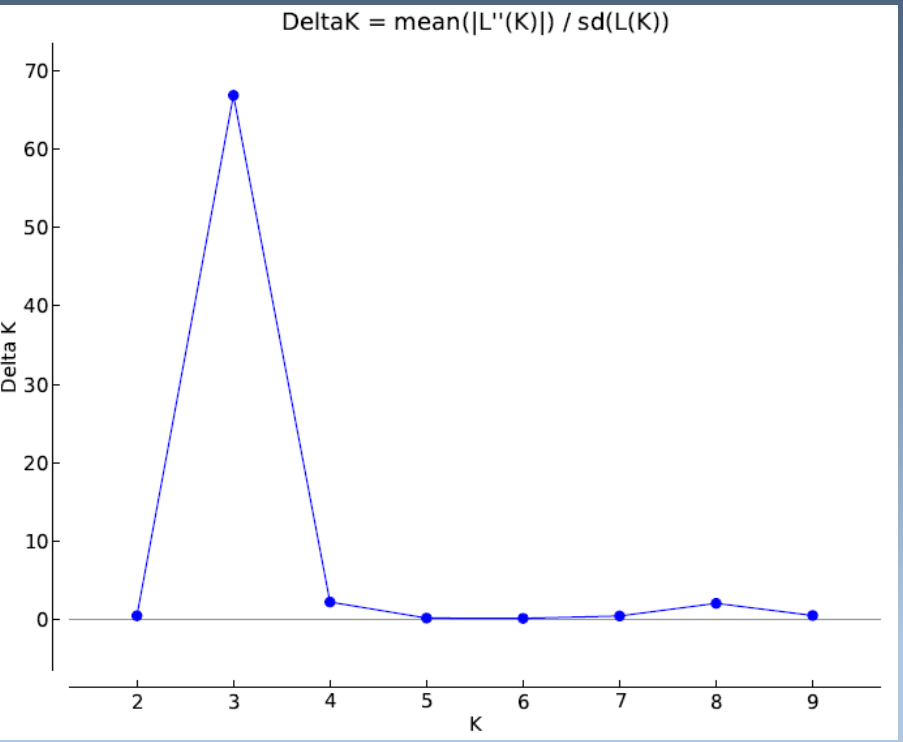
Pop 7 – *A. ventricosa* Cc 7064

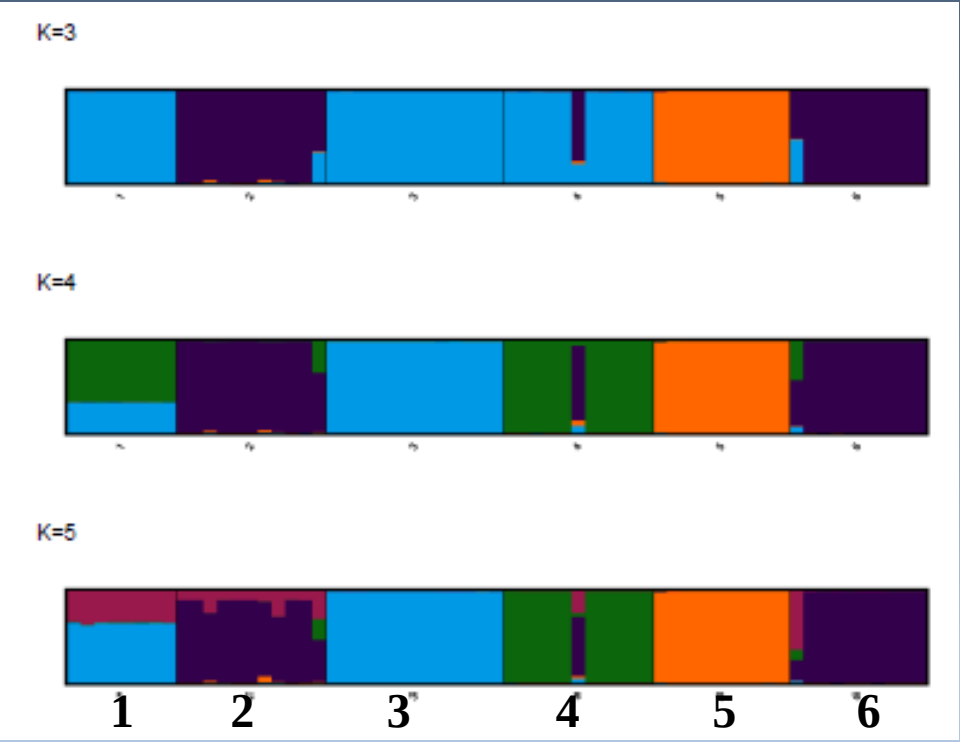
Pop 8 – *A. eriantha* JIC 2087
Cc 7065
PI 36738

Pop 9 – *A. clauda* Cc 7044

Assessing the genetic diversity of *Avena ventricosa* populations in Cyprus using molecular markers

Structure analysis





Why screening for *2n* gametes?

the importance of *2n* gametes

- evolution

- breeding

Use of 2n Gametes in Plant Breeding

A. Dewitte[1], K. Van Laere[2] and J. Van Huylenbroeck[2]
[1]*KATHO Catholic University College of Southwest Flanders, Department of Health Care and Biotechnology,*
[2]*Institute for Agricultural and Fisheries Research (ILVO), Plant Sciences Unit, Belgium*

Screening *Avena ventricosa* populations in Cyprus for the presence of 2*n* gametes

Ellison, W., 1937. Polyploid gamete formation in diploid *Avena* hybrids. J. Genet. 34: 287-295.

Euphytica **81:** 1–6, 1995.
© 1995 *Kluwer Academic Publishers. Printed in the Netherlands.*

Discovery of 2*n* gametes in tetraploid oat *Avena vaviloviana*

A. Katsiotis & R.A. Forsberg
Department of Agronomy, University of Wisconsin-Madison, 1575 Linden Dr., Madison, WI 53706, USA

Euphytica **133:** 81–94, 2003.
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Formation of 2n gametes in durum wheat haploids: Sexual polyploidization

Prem P. Jauhar
United States Department of Agriculture – Agricultural Research Service, Northern Crop Science Laboratory, Fargo, North Dakota 58105, U.S.A.; (for correspondence: e-mail: prem.jauhar@ndsu.nodak.edu)

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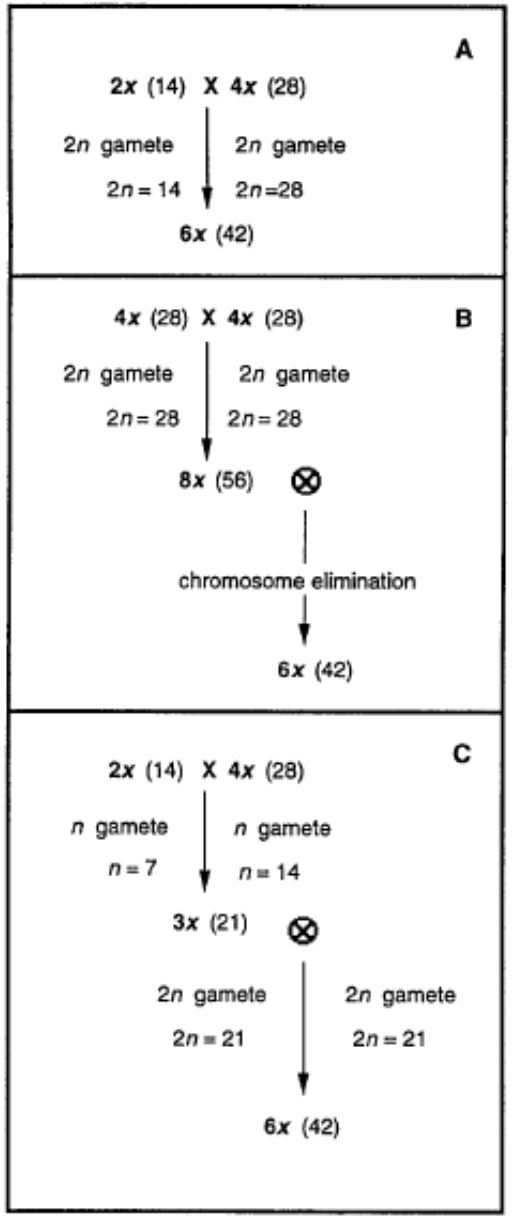

Fig. 4. Three evolutionary models for hexaploid *Avena*.

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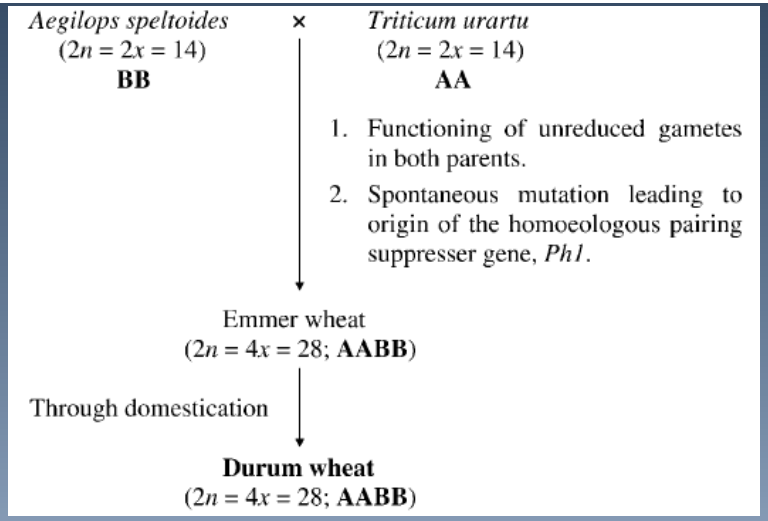
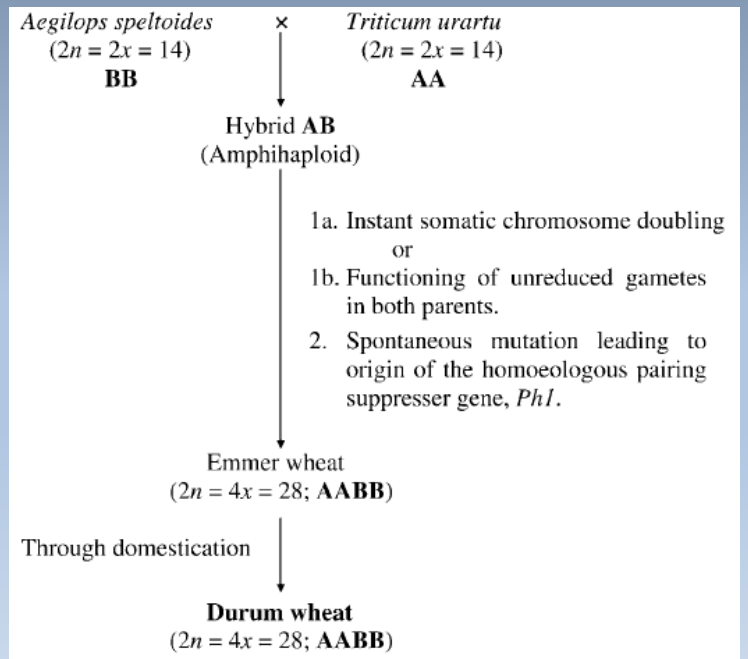




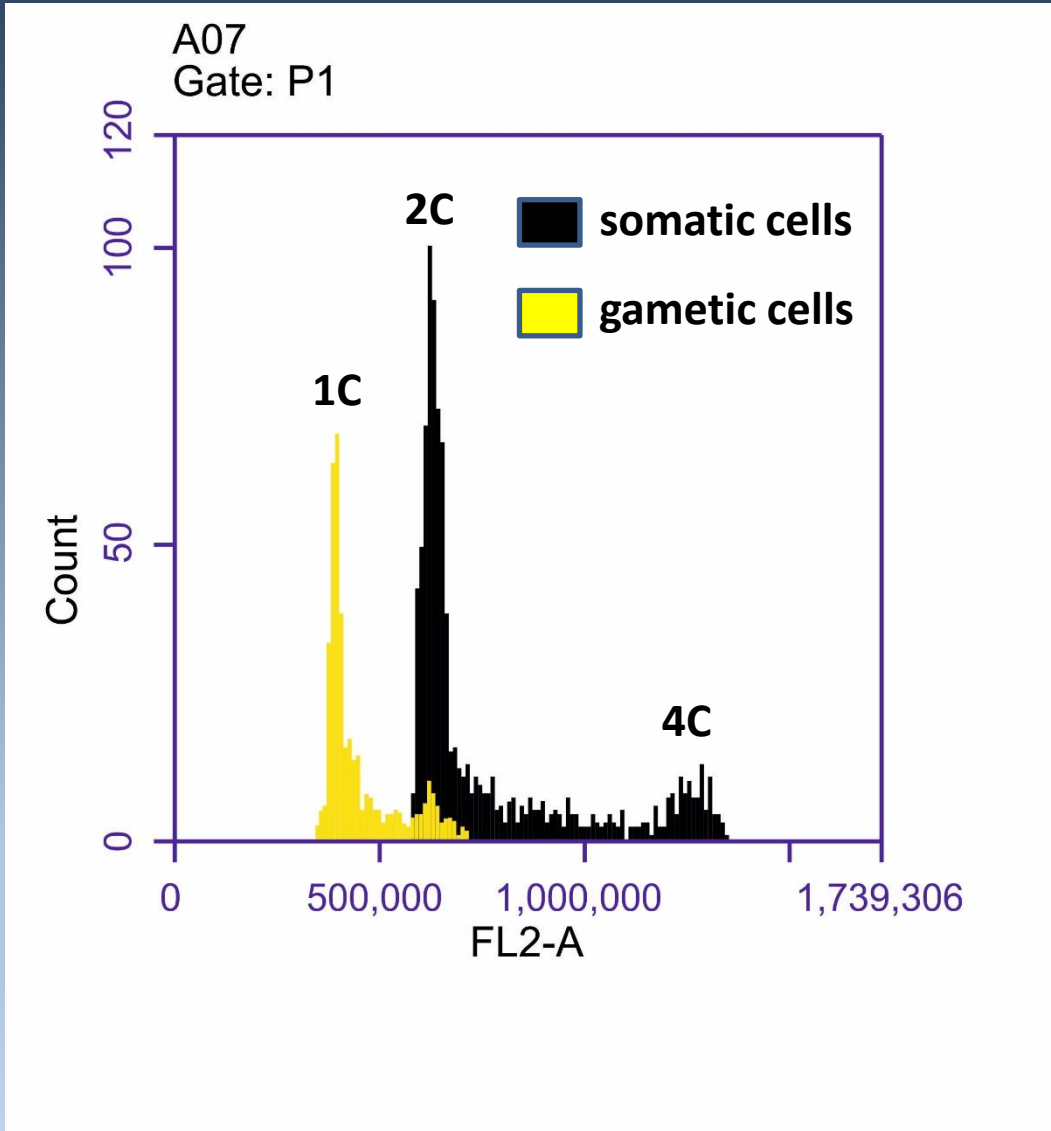
Screening *Avena ventricosa* populations in Cyprus for the presence of 2*n* gametes

Methods for screening material

Flow cytometer

Pollen

PMCs



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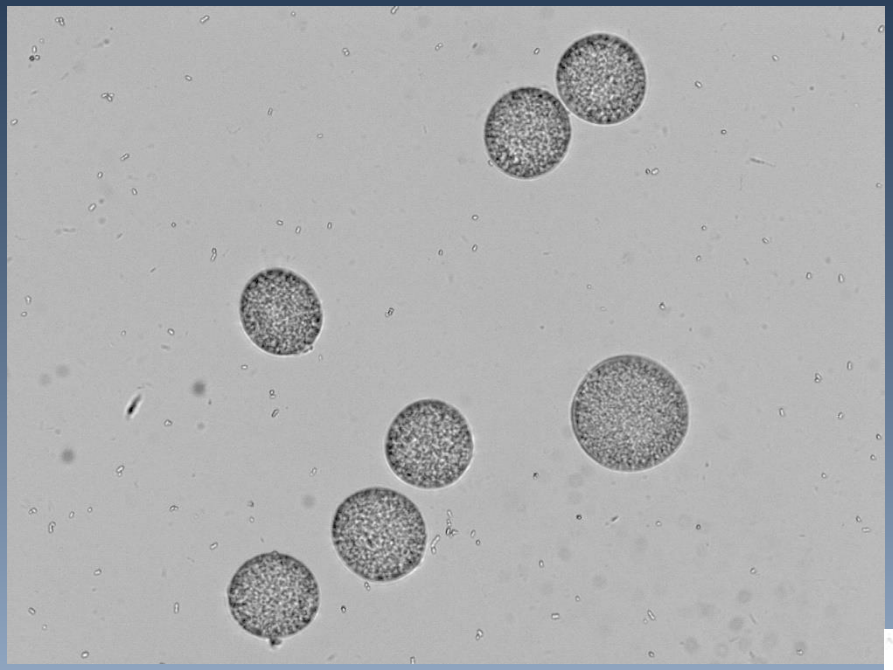
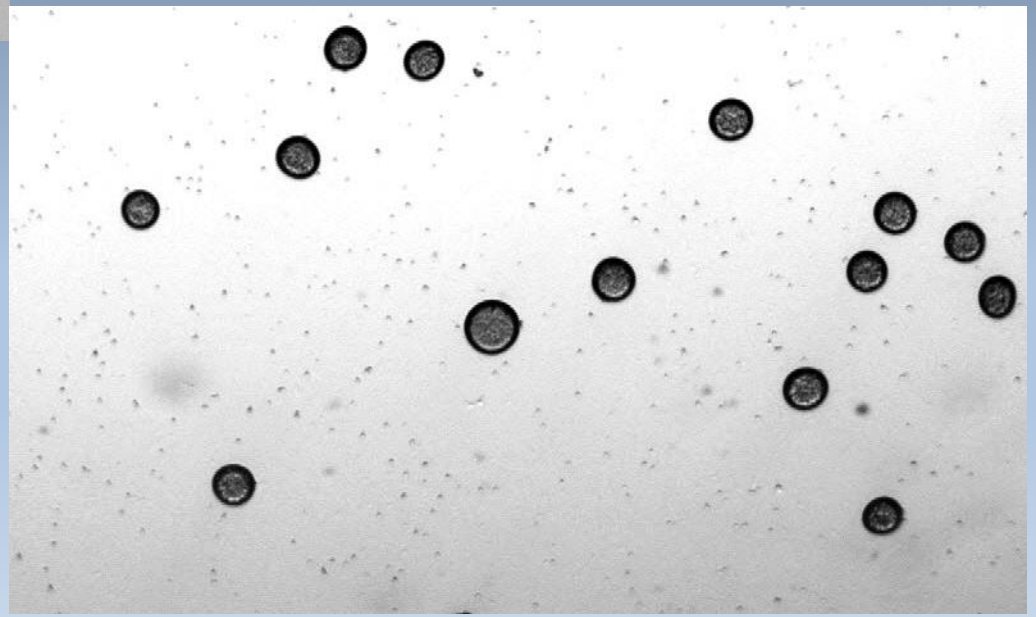


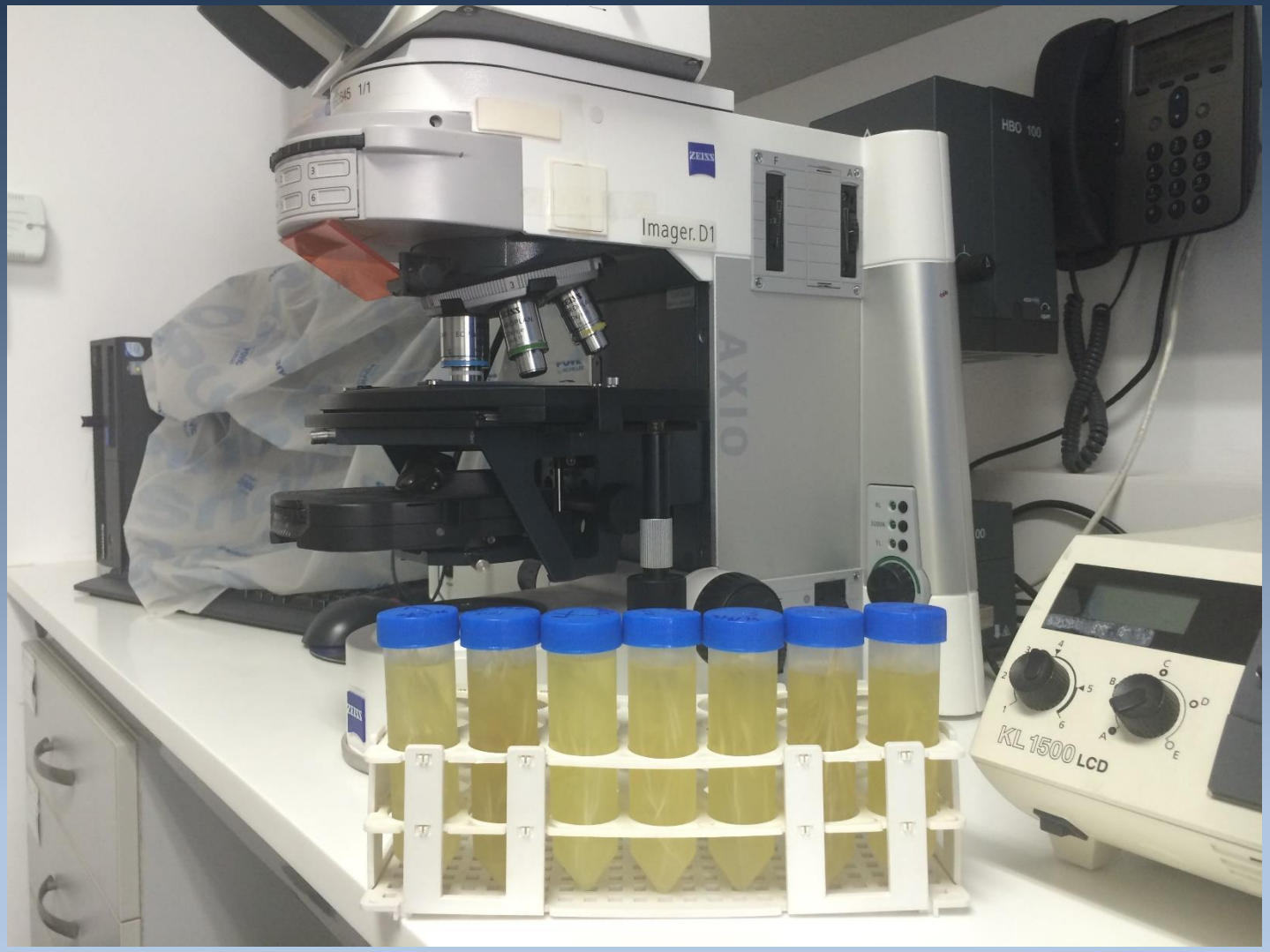
pollen grains



< 2%

Screening *Avena ventricosa* populations in Cyprus for the presence of 2*n* gametes

Pollen Mother Cells



to be continued…….