



Plant Propagation PLS 3221/5222

Guest Web Lecture
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Breeding Ornamental Plants

Chapter 5 Guest Lecture

Objectives are to Understand:

- Difference between sexual and clonal propagation
- Classical breeding: collection of germplasm, hybridization and selection
- Polyploidization
- Importance of multi-location, replicated trials



Sexual vs Clonal Propagation

- Sexual propagation is by seed
- It involves genetic recombination of the parental material (female and male) and recombination of traits



- Several generations of selfing are needed to “fix the genotype” and obtain a homogeneous population
- Open pollination or hybridization will result in a heterogeneous population

- For example, this hybridization in *Ruellia* resulted in the same flower color in the F₁ (homogeneous) and segregation in the F₂ (heterogeneous) generations



Sexual vs Clonal Propagation

- Clonal (or vegetative) propagation is by cuttings and all derived plants are homogeneous and genetically identical
- Many ornamental plants are vegetatively propagated for commercial sales



Steps in ornamental classical breeding

1. Selection of the genus and define objective(s)



1998 – *Anagallis monellii*



'Skylover Blue'

Breeding for a more compact growth habit

2000 – *Nolana* (“Chilean Bellflower”)

85 different species growing in Peru and Chile

Breeding new interspecific hybrids with new flower colors and better growth habit



2007 – *Ruellia* (“Mexican Petunia”)



2007 – *Ruellia* (“Mexican Petunia”)
Breeding for sterile, non-invasive plants



Paynes Prairie, Alachua County

What are some traits that make *Ruellia* invasive?



ability to grow in xeric to aquatic environments



prolific fruit and seed production



cleistogamous flowers under low light levels



explosive seed dispersal

Steps in ornamental breeding

2. Search and collection of germplasm: *Anagallis*



Anagallis monellii



Anagallis arvensis

2. Search and collection of germplasm



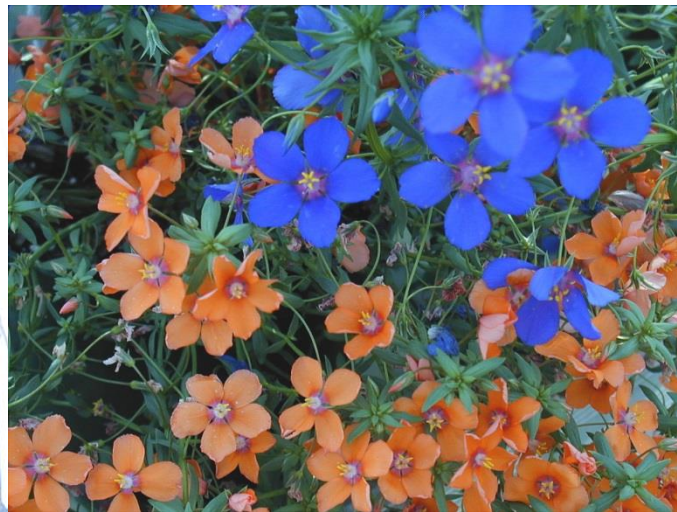
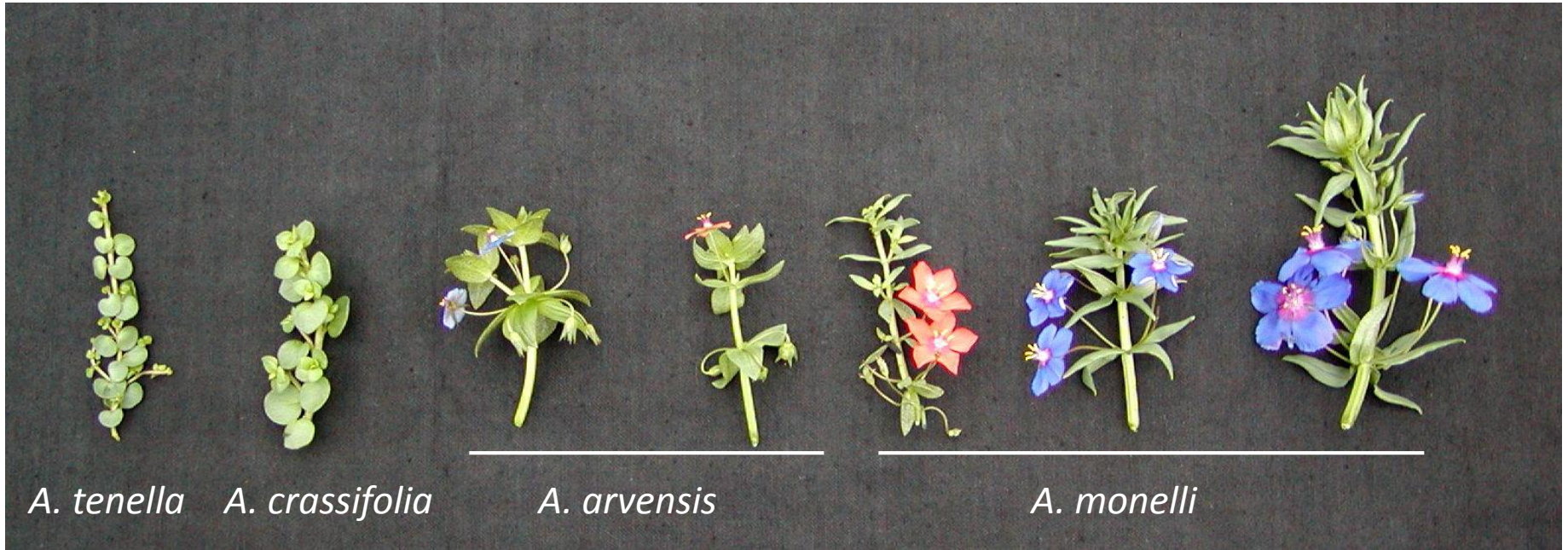
Sevilla, Spain



Sardegnna, Italy



2. Search and collection of germplasm

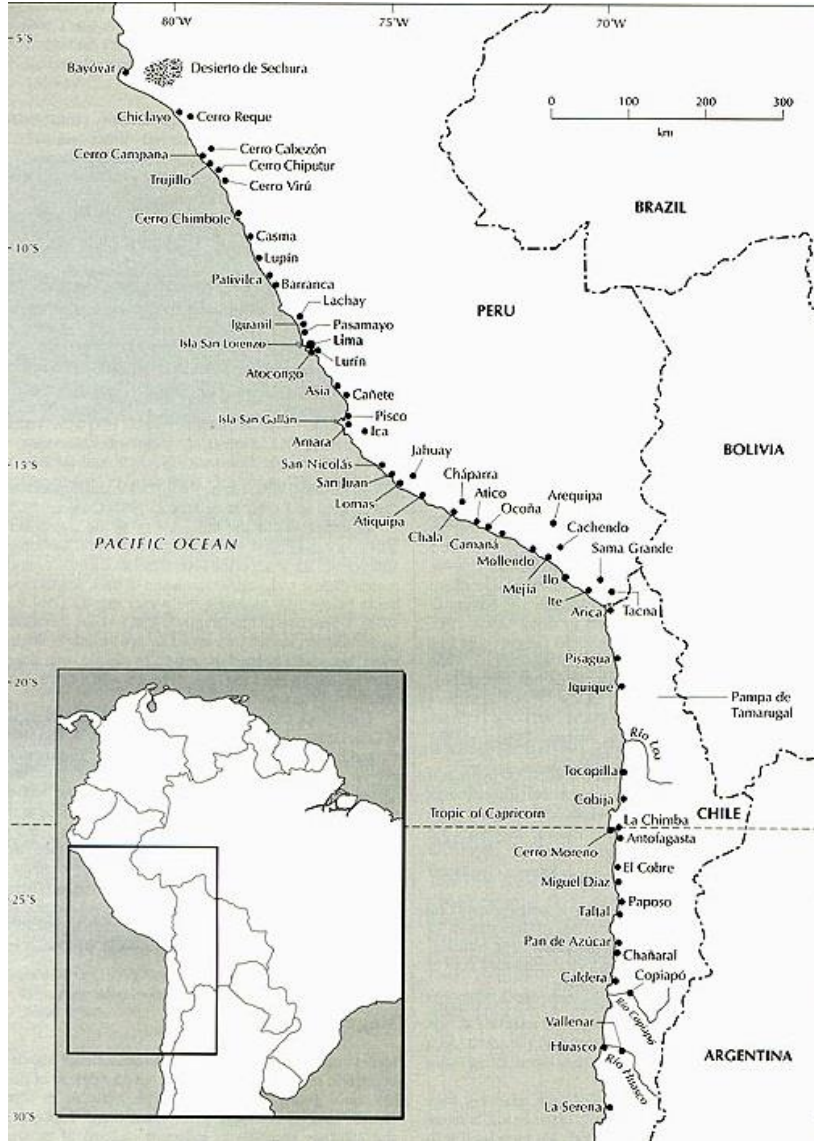


2. Search and collection of germplasm: *Nolana*



- *Nolana* is found in the coast of Peru and Chile, which are very arid deserts.
- Agriculture is only possible with irrigation from the rivers that flow from the Andes to the Pacific Ocean

- *Nolana* are found in “fog oases” that are formed in winter months and provide enough moisture for vegetation to grow



Collection trips in Peru in 2002 and 2003

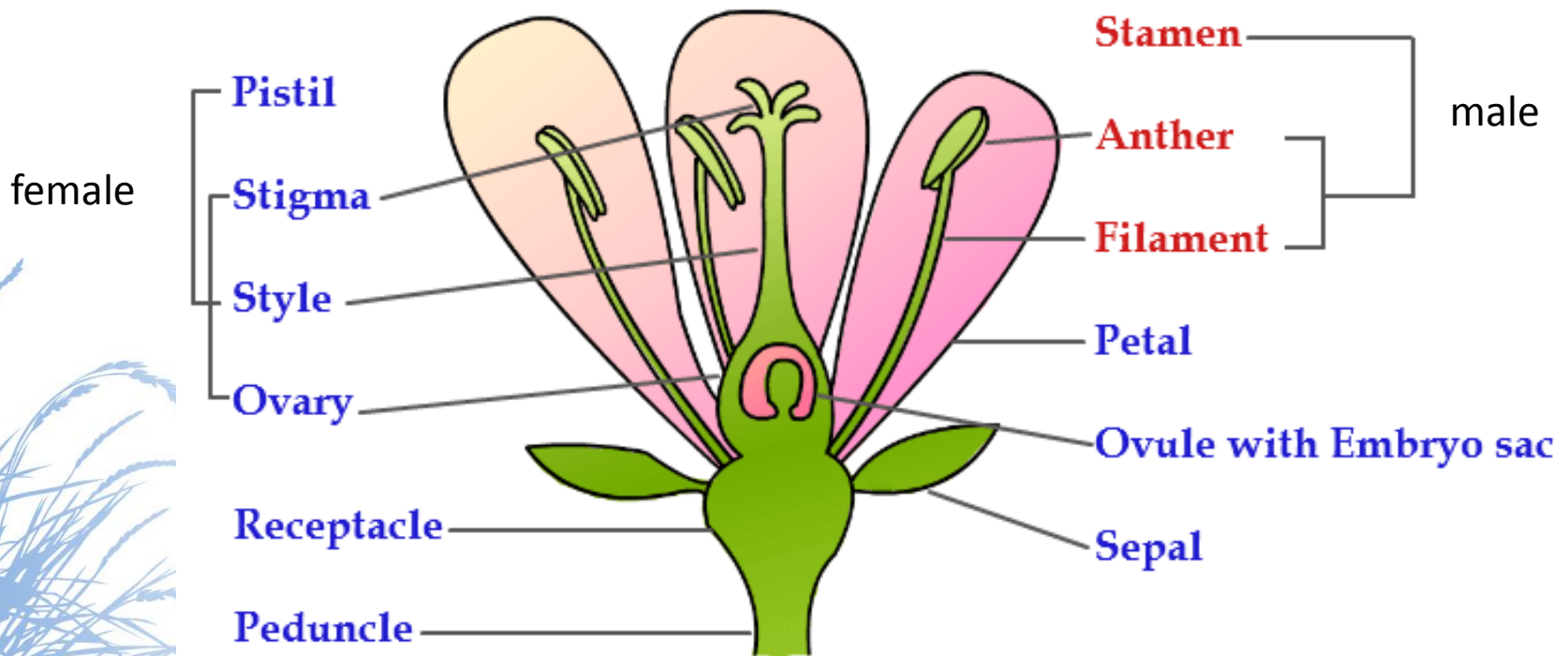


Collected a total of 21 *Nolana* species



Steps in ornamental breeding

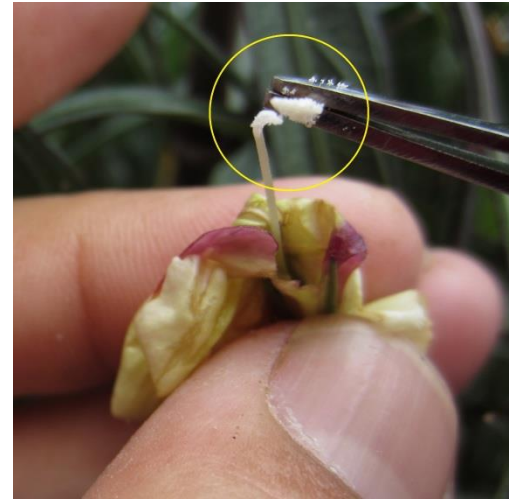
3. Hybridization (cross-pollination) within or between species



You need to learn about the anatomy and physiology of the species



emasculatation to prevent self-pollination



cross-pollination



explosive seed dispersal in *Ruellia*

You need to learn about the anatomy and physiology of the species



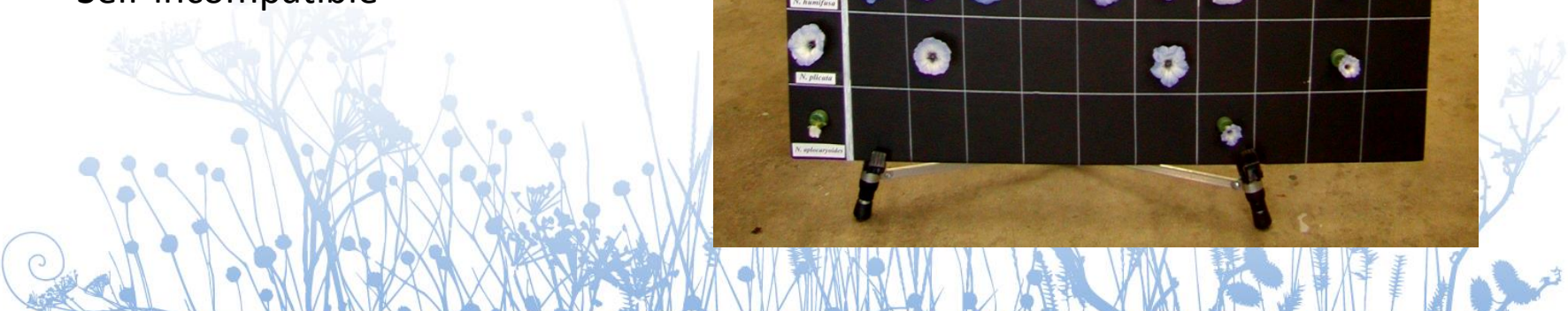
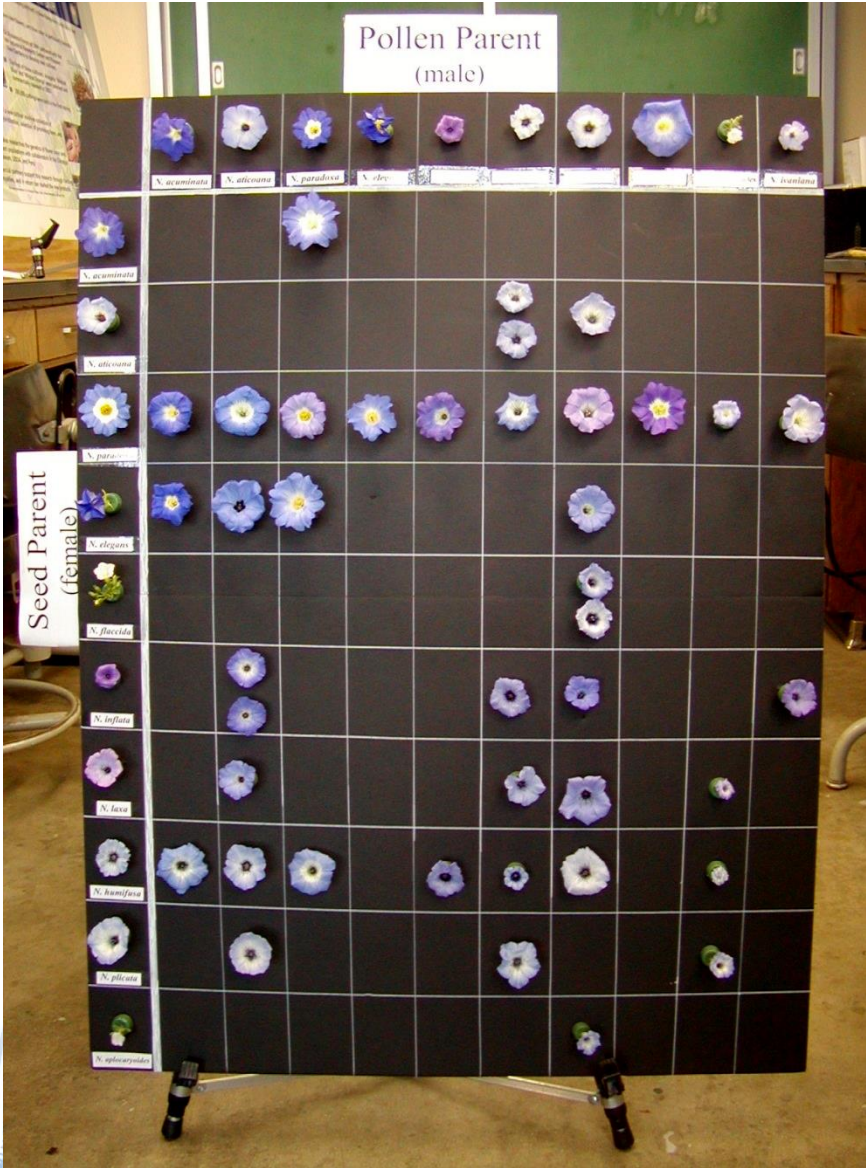
Hybridization in
Anagallis



Hybridizations between *Nolana* species



Perfect flower
Self-incompatible



You need to learn about the anatomy and physiology of the species



Sclerified mericarps



Mericarps with very low germination in *Nolana*

4. Selection process



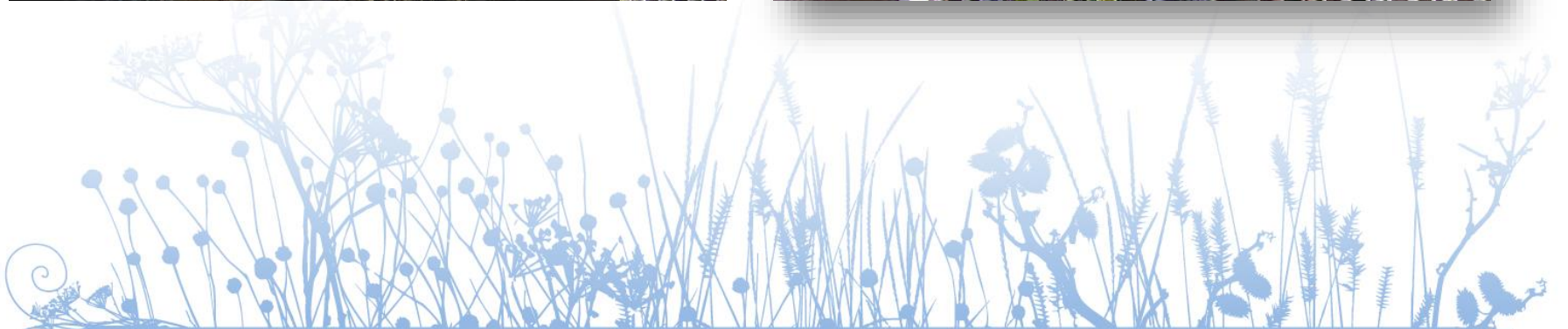
Selection for compact growth habit and good flowering in *Nolana*

4. Selection process



Selection for compact habit, flowering and no/low fruiting in *Ruellia*

4. Selection process – clonal propagation of selected plants in the spring

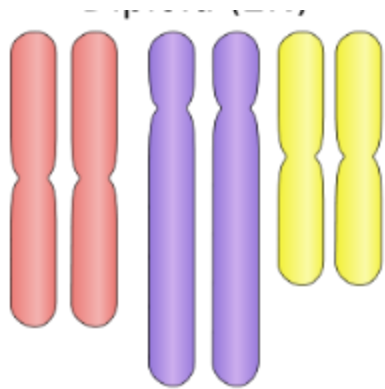


4. Selection process – trials in containers and in the field



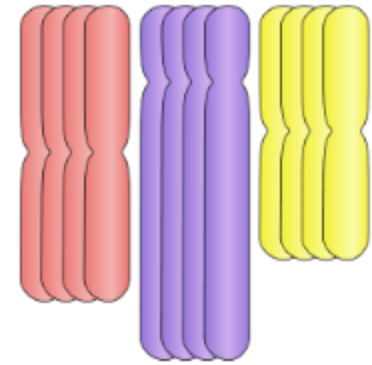
Polyploidization

- Development of individuals (polyploids) that have more than the normal two sets of chromosomes



diploid (2x)

colchicine or oryzalin



tetraploid (4x)



- There are different methods used to apply colchicine or oryzalin (Surflan) on the meristems



- Polyploids usually have bigger organs i.e. flowers

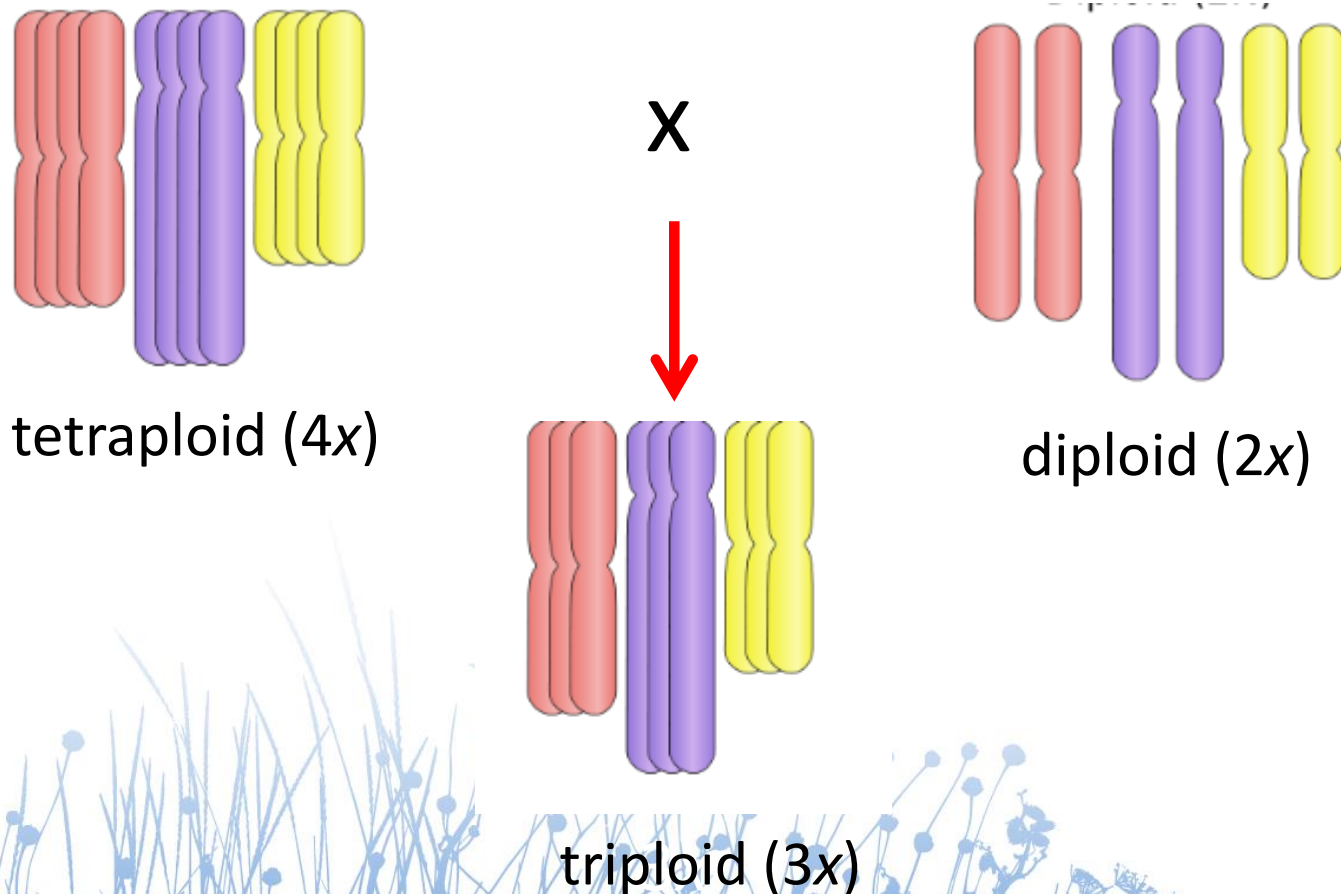


- Color range and flower size obtained with polyploidization and hybridizations in *Anagallis*



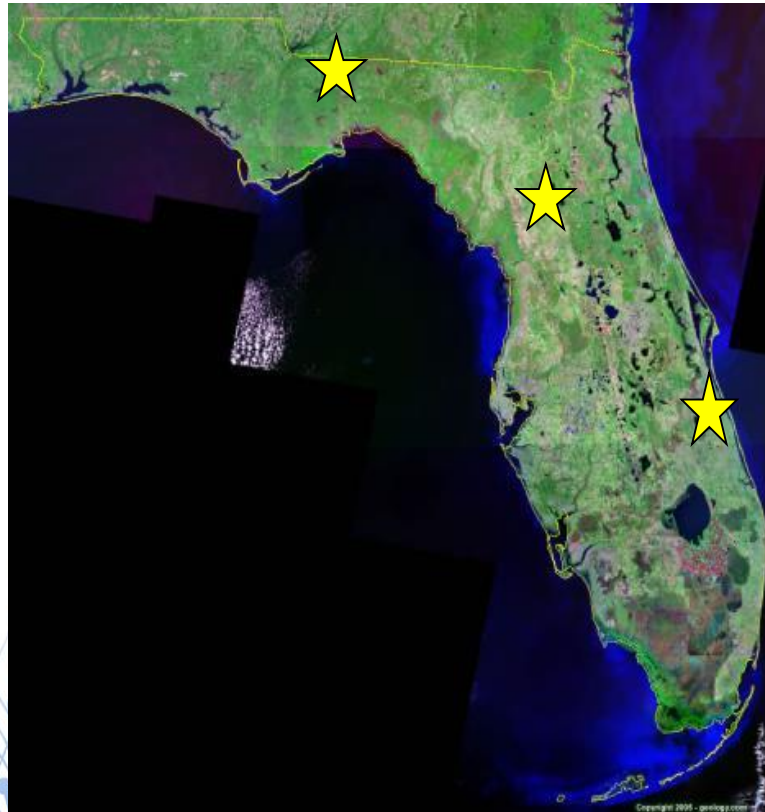
Polyploidization

- Another important aspect of polyploidization is the development of triploids, which are usually sterile



Importance of multi-location, replicated trials

- The environment has a big effect on a plant's performance
- Ideally, breed for plants that have tolerance for a wide range of environments



- Importance of multi-location, replicated trials



Ruellia, 2011
3 locations
3 blocks
3 plants/block

Results

Anagallis 'Wildcat Blue', 'Wildcat Orange',
'Wildcat Mandarin', 'Wildcat Pink'



2002

Results

Browallia "Endless"



2006

Results

Nolana 'Loma Blanca'



2006

Results

Ruellia 'Mayan Purple' and 'Mayan White', 2011



Ruellia 'Mayan Pink', 2013

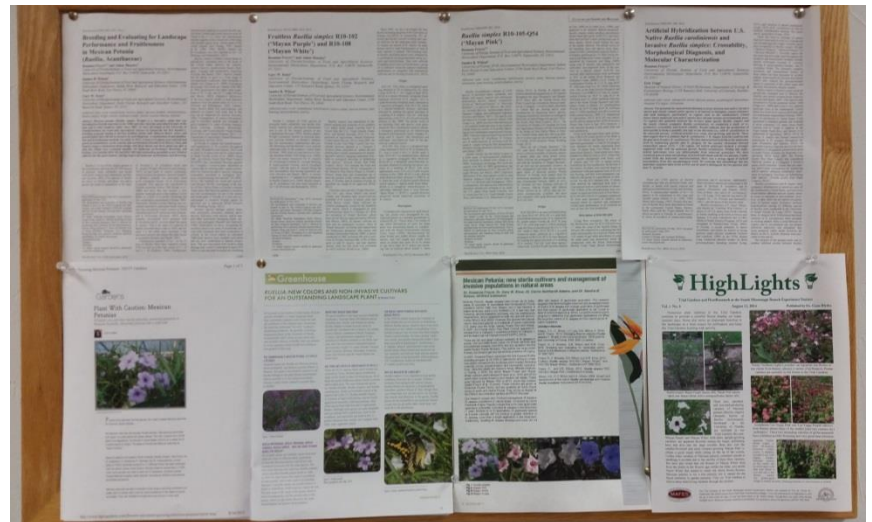


Results



10 US plant patents, 2 more pending royalties

16 peer-reviewed articles
3 popular articles
1 book chapter
(‘04 – ‘14)



Thank you!

