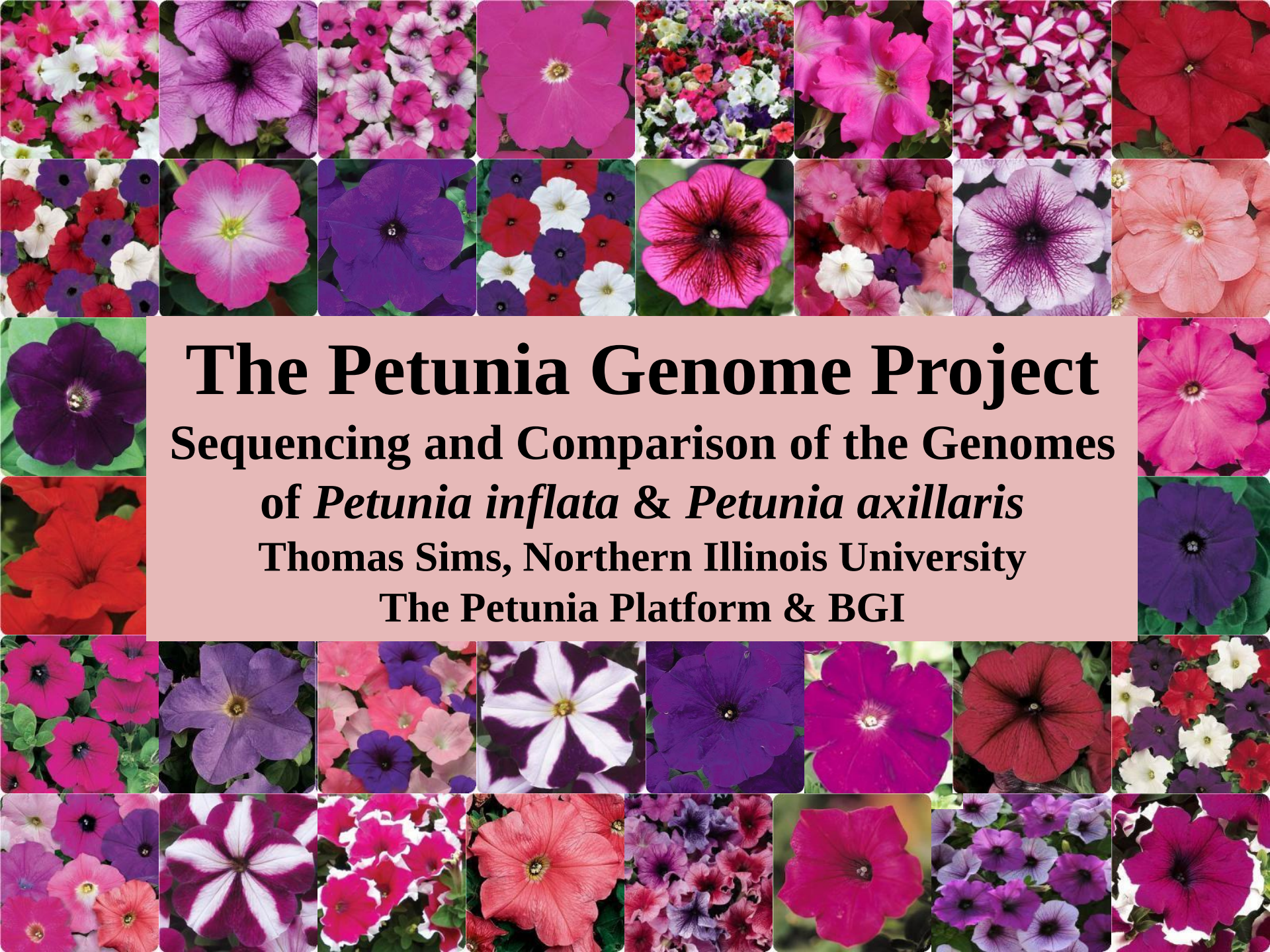

The Petunia Genome Project

Sequencing and Comparison of the Genomes of *Petunia inflata* & *Petunia axillaris*

Thomas Sims, Northern Illinois University

The Petunia Platform & BGI

The Petunia Platform (www.petuniaplatform.net)

The Petunia Platform

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12th World Petunia Days 2012

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Published Nov 10, 2004
Updated Nov 1, 2012

Project Goals

- Determine genomic DNA sequence of two *Petunia* genomes:
  - *Petunia axillaris*
  - *Petunia inflata*
  - Chosen because these are the progenitors to *Petunia hybrida* (commercial garden petunia)
- Annotate and compare genomic sequences
  - To each other
  - With other species in the Solanaceae
  - With other sequenced species
- Release data to the public via SGN (Solanum Genomics Network)

Why Petunia?

- Well characterized
- Known genetics, phylogeny
- Large flowers, easily pollinated
- Easily transformed
- Model species for biochemical investigations
- Genomic tools already available

P. axillaris (SC)

Petunia hybrida

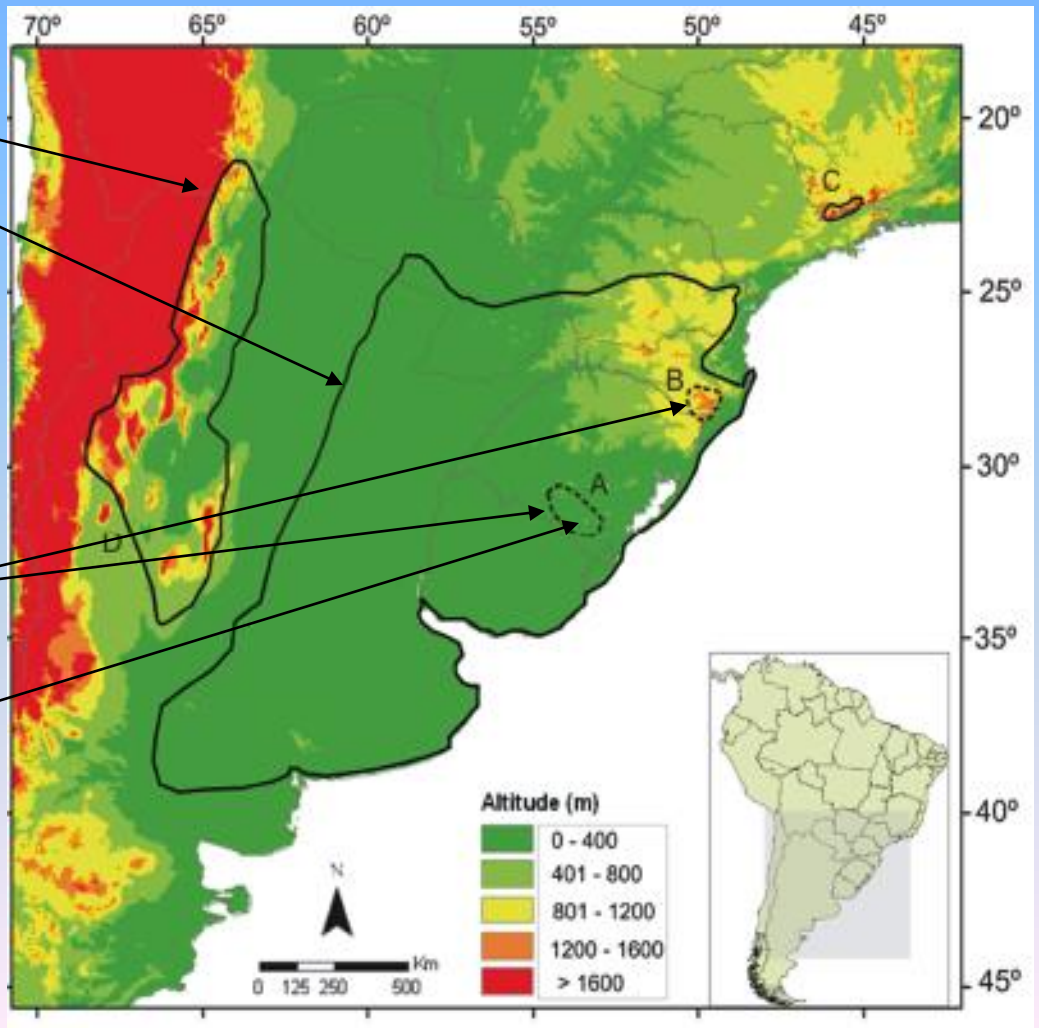
P. integrifolia (SI)

Native to South America (Brazil) numerous sub-habitats

Species distribution

Centers of species diversity

Serra do Sudeste (*P. axillaris* & *P. integrifolia)*

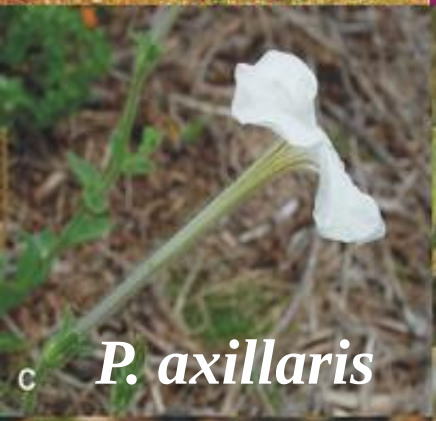


Stehmann, JR. The Genus *Petunia*, 2009

Petunia species

JR Stehmann et al., The Genus *Petunia*, 2009

14 species; 2n = 14



Petunia as a Model Organism

- Pigmentation, synthesis & regulation
- Volatiles, production & regulation
- Pollination syndromes
- Reproduction and self-incompatibility
- Floral induction and senescence
- Transcription factors in floral organ development
- Vegetative branching
- Arbuscular mycorrhizal symbiosis

#1 Floriculture Crop in overall sales

USDA Wholesale Value 2010 ($ millions)

Crop	Flats	Baskets	Total
Petunia	**65.9**	**30.21**	**96.11**
Pansies	66.7	4.95	71.65
New Guinea Impatiens	3.1	18.48	21.58
Marigolds	36.2	0.3	36.5
Impatiens	70.6	13.43	84.03
Geraniums	9	28.88	37.88
Begonias	34.2	9.56	43.76

Current Genomic Resources

- Genetic maps
  - *P. axillaris x P. inflata* BC_1 mapping population
- Numerous mutants
- BAC libraries
- Insertional mutant libraries (*dTph1*)
- EST and RNA-Seq databases
- Related species in Solanaceae sequenced

Timeline

- Genomic DNA for *P. axillaris*, *P. inflata* sterile, homozygous lines (done)
- BGI has carried out Illumina sequencing of the separate genomes (done)
- Assembly by BGI, BTI-Cornell (in progress)
- Annotation by BTI-Cornell, Northern Illinois University, University of Verona (starting)
- Publication & Release later in 2012
- Sequencing of other spp. (e.g. *P. exserta*)?

Assembly & Annotation

- Assembly
  - SOAPdenovo
  - ABySS, possibly ALLPATHS
- Annotation
  - MAKER

Sequencing Progress

- *Petunia inflata*
  - Genome sequenced, Assembled by BGI. Reassembly in-process by BTI-Cornell
- *Petunia axillaris*
  - Genome sequences, Assembly in-process by BTI-Cornell
- RNA-Seq
  - RNA-Seq from *P. inflata* (fertilized ovary, floral bud, inflorescence, callus, seedling), University of Verona

Assembly Statistics

(Aureliano Bombarely Gomez, BTI-Cornell)

Parameters				Scaffolds				
Species	**Group**	**k-mer**	**Total (Gb)**	**Longest**	**N90 length**	**N90 number**	**N50 length**	**N50 number**
P. inflata	BGI-HK	17	1.32	786641	127	388342	79287	4341
P. inflata	BTI	**31**	0.52	46180	100	2579079	**147**	790123
P. inflata	BTI	**47**	1.06	529569	121	1853247	**11360**	18764
P. inflata	BTI	**63**	1.39	741287	127	2133222	**20769**	13883
P. axillaris	BTI	**31**	0.48	5931	102	2256321	**158**	686259
P. axillaris	BTI	**47**	1.07	769100	126	1450576	**19305**	12624
P. axillaris	BTI	**63**	1.34	1055557	127	1765676	**35416**	9015

NIU

Sims

Johns

Radboud Univ Nijmegen

Gerats

VU Amsterdam

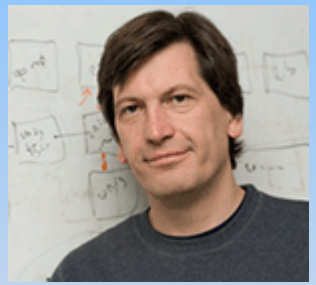
Quattrocchio

华大基因 BGI

Univ. Verona

Delledonne

Boyce-Thompson



Mueller

Gomez

Pezzotti