The Petunia Genome Project
Sequencing and Comparison of the Genomes of *Petunia inflata* & *Petunia axillaris*
Thomas Sims, Northern Illinois University
The Petunia Platform & BGI
Project Goals

• Determine genomic DNA sequence of two Petunia genomes:
  – Petunia axillaris
  – Petunia inflata
  – Chosen because these are the progenitors to Petunia hybridra (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)

*P. integrifolia* (SI)

*Petunia hybrida*
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

14 species; 2n = 14

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

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Current Genomic Resources

• Genetic maps
  – *P. axillaris x P. inflata* BC₁ 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)

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