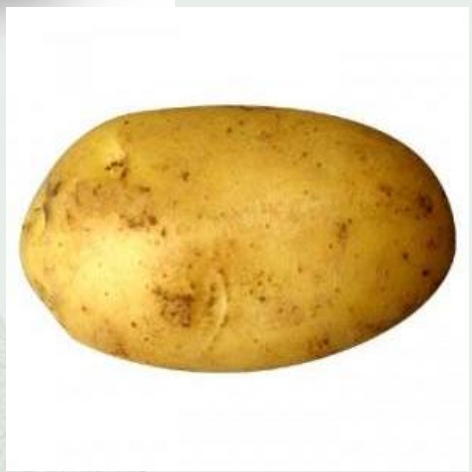
The transPLANT project is funded by the European Commission since September 2011 within its 7th Framework Programme under the thematic area "Infrastructures", contract number 283496.

transPLANT Workshop 2014

Exploiting and understanding Solanaceous genomes

MANUAL



Gabino Sanchez-Perez
Manuel Spannagl
Cyril Pommier
Dan Bolser
Lorena da Ponte
Antoine Janssen
Sven Warris
Aalt-Jan van Dijk
Matthias Lange
Richard Finkers
Jan-Peter Nap (ed.)

Part of the transPLANT

European Plant Genomics Infrastructure

Wageningen
October 2014

Preface

Welcome at the third transPLANT training workshop, now focussing on 'Exploiting and understanding Solanaceous genomes'. Many solanaceous genomes are 'ready' and await application. Many more genomes are on their way. The workshop will show some of the analytical tools available and made by the transPLANT consortium, a vibrant EU project on its way to establish a suitable infrastructure for plant omics research. We encourage you to visit http://www.transplantdb.eu/ for more tools, data and applications.

Being able to use the information available is the result of the efforts of various biologists bioinformatics researchers and IT specialists, many of which have done and still do quite a lot of work 'in the shade'. Harvesting the fruits of their efforts now asks efforts from you, as a researcher as well as a tester. Tools for analysis should be experienced and used to decide on their added value. Therefore, this workshop takes a simple and straightforward 'do-it-yourself' approach: learning by doing. The best would be to consider the examples as much as own data and use the resources with own data as soon as possible.

It aims to get you as the researcher without any (formal) training in bioinformatics the feel of how to look at, analyze, integrate and use the various types of data now available. In addition, your efforts may result in additional wishes for functionality that can be added in the future. Please let us know if this is the case.

We hope this manual may have some added value as future reference, although data and many resources in bioinformatics keep being updated on an almost daily basis. Participants are therefore encouraged to keep visiting the websites and tools introduced in this workshop for updates, improvements and new functionality.

On behalf of transPLANT and all involved in organizing and preparing this workshop, we wish you a smooth ride.

Jan-Peter Nap, Wageningen
Manuel Spannagl, Munich

October 2014

Final Program 3rd transPLANT Training Workshop

Exploiting and understanding Solanaceous genomes

Place: Wageningen University, Radix Building, opposite of and in computer hall PC95

Day 1 - October 13, 2014

18:00 *Welcome dinner/get2together/short introduction of participants*

19.20 - 20:00 Overview of program - WUR IT system – status of solanaceous genomes.
WUR – Gabino Sanchez Perez; Jan-Peter Nap; MIPS – Manuel Spannagl

20.00 - 21:30 Mining solanaceous data with GnpIS
URGI – Cyril Pommier

21.30 *End of program Day 1* - Wageningen-by-night
(moderately guided; costs on your own).

Day 2 – October 14, 2014

8.40 *Opening*

8:45 - 10:00 Mining structural variation in solanaceous genomes
EMBL-EBI – Dan Bolser

10.00 *Tea and coffee*

10:20 - 11.30 Fast and easy variation querying in tomato genomes
KeyGene – Antoine Jansen, Lorena Da Ponte

11:30 - 12:45 Protein function prediction with BMRF
WUR – Sven Warris, Aalt-Jan van Dijk

12.45 *Lunch*

13:45 - 15:00 Mining integrated data sources using LAILAPS
IPK – Matthias Lange

15.00 *Tea and coffee*

15:30 - 16:45 Advanced breeding of solanaceous crops using BreedDB
WUR – Richard Finkers

16:45 - ? *Overall wrap up, evaluation, closure and departure*

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German Research Center for Environmental Health

About the transPLANT consortium

Manuel Spannagl (slides adapted from Paul Kersey, EBI)

Oct 2014, 3rd user training workshop Wageningen

transPLANT

- ***Trans-national Infrastructure for Plant Genomic Science***
- A 4 year EU FP7-funded project (DG CONNECT) coordinated by EMBL-EBI
- An I3 project with elements of coordination, service and RTD
- Involves 11 European partners including companies

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transPLANT partners

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Project Aims

transPLANT will:

- Identify a common set of reference data to be shared between different researchers and service providers
- Construction of missing data archives
- Provide tools to manipulate and mine plant genomic data
- Provide an integrating point of interactive access to diverse data sets
- Provide a compute environment for programmatic access to plant genomic data
- Develop common standards for use within transPLANT and a wider community
- Train potential users
- Engage with other related communities to share experiences, tools and roadmaps

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http://www.transplantdb.eu

Find out more, and perform integrated search of all transPLANT member resources

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German Research Center for Environmental Health

http://www.transplantdb.eu

Resources registry @ transPLANT:

> 300 distinct plant genome resources registered incl. URL, version info, tools, …

Keyword search available, e.g. ‘tomato’

Manually curated, updated regularely

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User training @ transPLANT

- We are organizing a series of **user training workshops** to introduce and train in transPLANT plant genome resources and tools
- Different core areas covered such as triticeae or *Solanaceae* resources
- Additional user training workshops at conferences (PAG, …) or on request!
- Online user training materials available (tutorials, videos, …) at transPLANT webhub: http://www.transplantdb.eu/

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1st transPLANT user training workshop: „Exploring triticeae resources“

12-13 November 2012 in Versailles, France
INRA URGI campus

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2nd transPLANT user training workshop:
„Exploring triticeae resources“ – hands-on

27-28 June 2013 in Poznan, Poland, Adam Mickiewicz University campus

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HelmholtzZentrum münchen
German Research Center for Environmental Health

3rd transPLANT user training workshop:
„Exploiting and understanding Solanaceous genomes“

WAGENINGEN UNIVERSITEIT
WAGENINGEN UR

13-14 October 2014 in Wageningen

transPLANT

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German Research Center for Environmental Health

Status of Solanaceous Genomes

13-10-2014 ‘Exploiting and understanding Solanaceous genomes’

Gabino F. Sanchez-Perez

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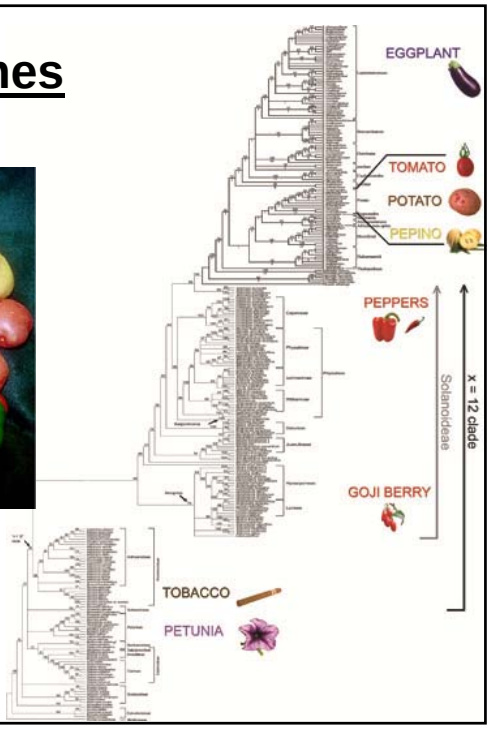
Solanaceae genomes



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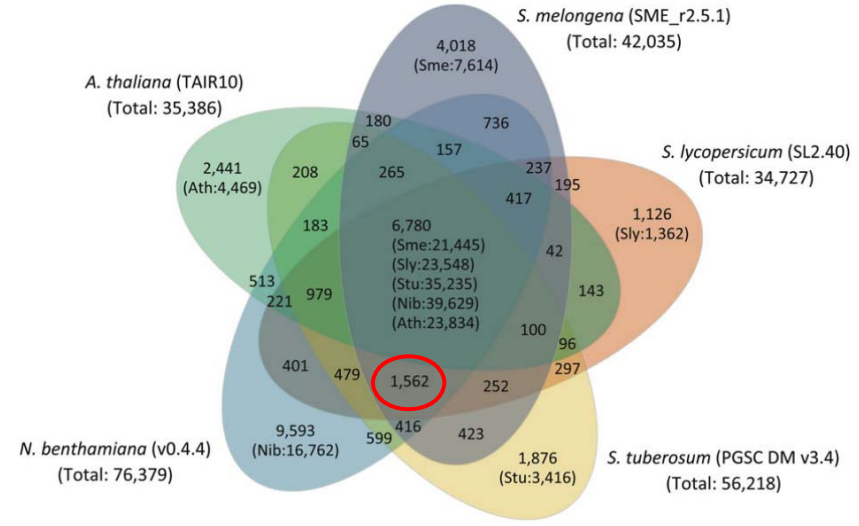
Gene content in Solanaceae



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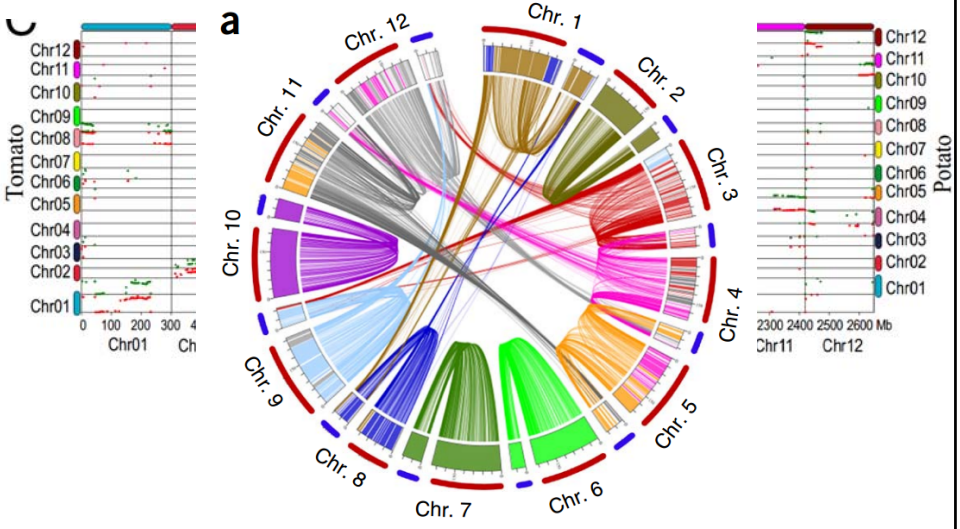
DNA research 2014 doi:10.1093/dnares/dsu027

Solanaceae synteny conservation



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Nat. Genet 2014 46:3
PNAS 2014 111:14 5135-40

150 tomato (re)-sequencing project

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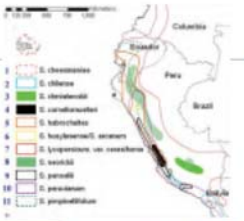
Rationale

- Cultivated tomato has lost valuable traits during domestication
- Genetic diversity in commercial tomato germplasm relatively narrow
- Unexploited genetic diversity available in land races and old varieties?
- Wild species - source of genetic diversity
  - Diverse habitat
  - Variation in flowers and fruits
  - Variation in mating systems
- All wild species can be crossed with cultivated tomato (introgression breeding)



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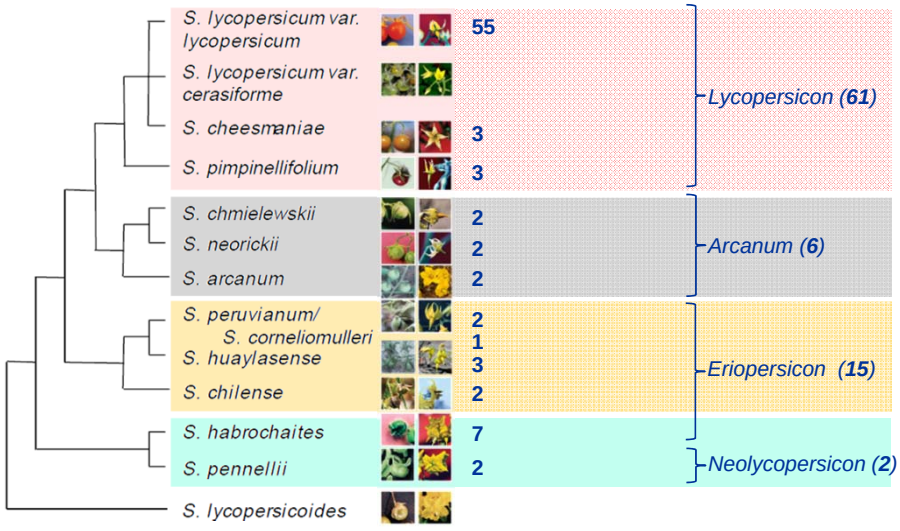
The targets - diversity



Moyle, 2008

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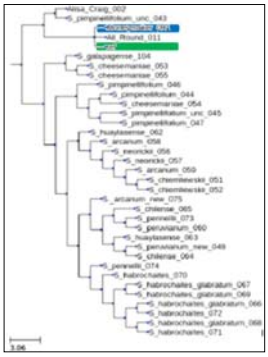
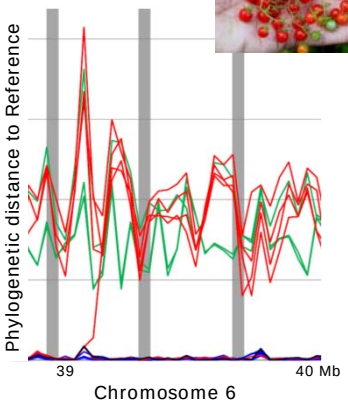
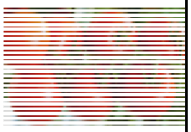
Structural variations at chromosomal level





S. pimpinellifolium
S. cheesemaniae
S. lycopersicum 'Moneymaker'
S. lycopersicum 'Alisa Craig'



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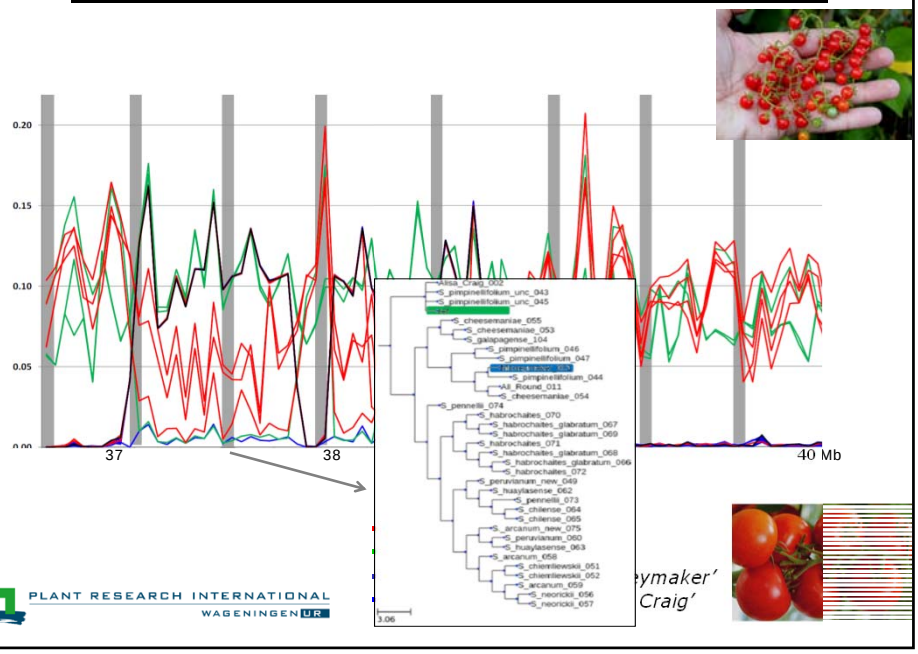
Structural variations at chromosomal level



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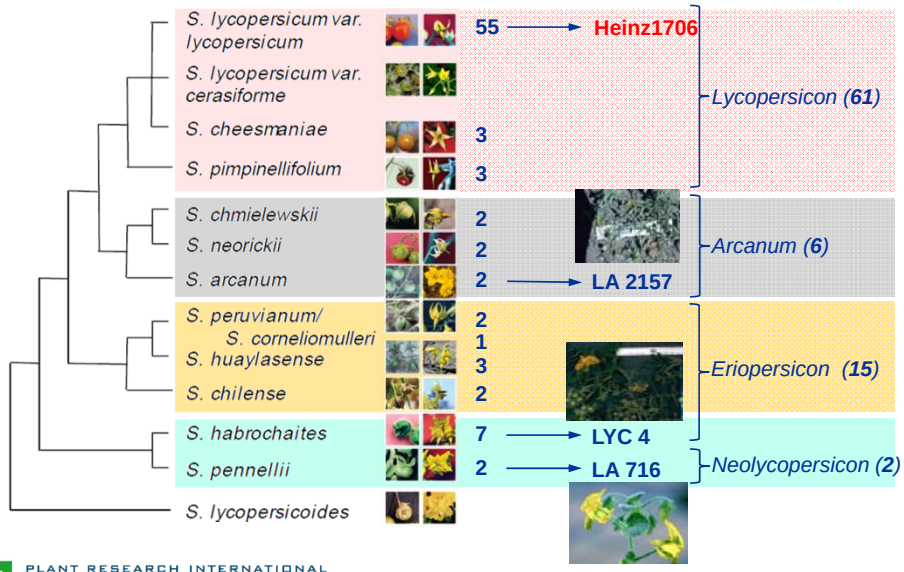
Reference genomes: *De novo* assembly selection



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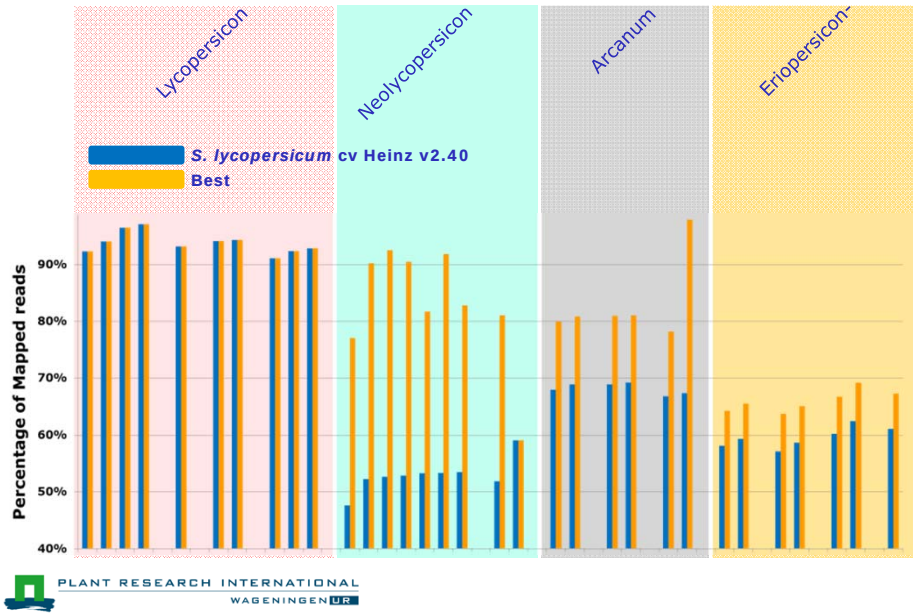
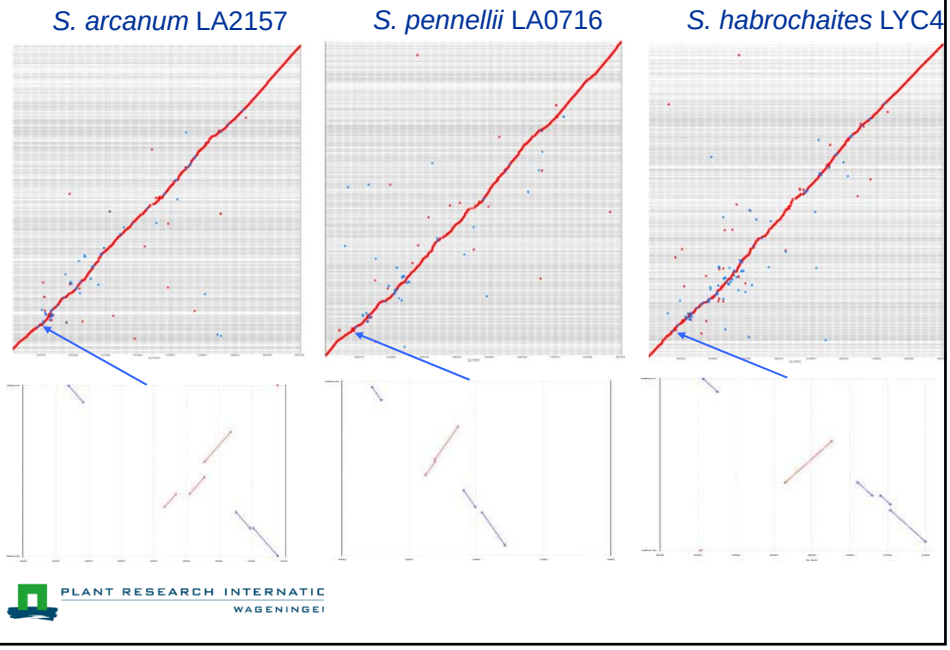
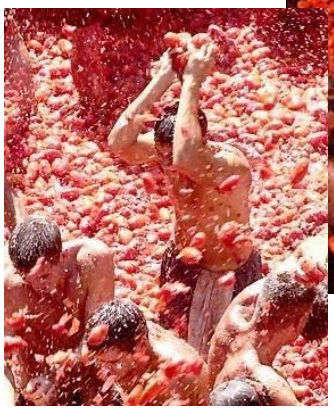
Mappability depends on the reference



Dot plot – Assessing rearrangements



Let the fun begin!



- http://www.tomatogenome.net
- https://www.eu-sol.wur.nl

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List of participants and instructors transPLANT Workshop

Exploiting and understanding Solanaceous genomes

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