

## **The Future of Rosaceae Genomics – What's next? RGC3 Workshop 7**

Napier, New Zealand; 22 March 2006

Co-chairmen: Sue Gardiner, Pere Arus, Vladimir Shulaev

'Agenda'

1. Scientific challenges – what needs to be done?
2. Tools and resources – how can we do it?
3. Resource and data sharing – how can we work together?
4. Community-wide effort and white papers – how do we coordinate the effort?
5. Reduction to practice – how to translate discoveries into products?
6. Funding strategy – where to get money for research?

### **1. Scientific challenges:**

Ideas and challenges:

'Are working on current issues, not looking to the future as need to'

Significant areas of challenge brought up were:

Comparative genomics

- Genome sequencing across Rosaceae
- Comparative mapping – need robust transferable markers as a resource

Work on fruit quality

- New traits/new ways to solve problems
- Tools for determining gene functionality
- Understanding how genes control fruit quality
- Identification of new traits and how to get them into fruit
- Inconsistent fruit quality at market place is problem
- Genetic basis of postharvest physiological disorders
- Look at fruit of today and how to compete with other food products (what can be/needs to be incorporated to maintain/develop competitive edge)
- Fruit to fruit variability
- Technologies for the consumer to gauge internal fruit quality (marker labels?)

Work on disease resistance

Plant growth and development

- Developmental biology/all aspects of biology important
- Cut flowers and architectural traits important

Humanitarian challenge (what can be done with orphan Rosaceae crops that are supplied/available through supermarkets)

#### Production

- Labour issues in the orchard
- Costs of propagation (currently using old techniques, develop new technologies)

#### Marketing/selling products

- Identification of traits that will promote sales (identifying what the world wants in 10-15 years time)
- Acting on market analyses/demands or scientific challenges

Relative benefits of one research approach over another (rosaceous crop over non-rosaceous crop as model species)

It is obvious that the challenges extend beyond the scientific. The group was reluctant to prioritize issues. (This is something for the RosIGI steering group to work on!)

## **2. Tools and resources – how can we do it?**

These include:

### Genetic Resources and tools

#### Germplasm collections

- Mapping populations and NILS (radiation hybrids)
- Genetic markers
- High throughput genotyping
- Reverse and forward genetic tools

#### Genomics tools

- Full genomic sequencing – representative genomes
- Genomic libraries and physical maps
- ESTs and unigene sets
- Microarrays, proteomic and metabolomic tools

#### Gene function validation

- Robust phenotyping
- High throughput plant transformation systems
- Cross-validation

#### Bioinformatics software and databases

### **Issues brought up during discussion focussed on:**

The need to build community-wide resources (e.g. microarrays, databases and acknowledge ownership) and establish mechanisms for sharing.

- The need for common transferable genetic markers across genera

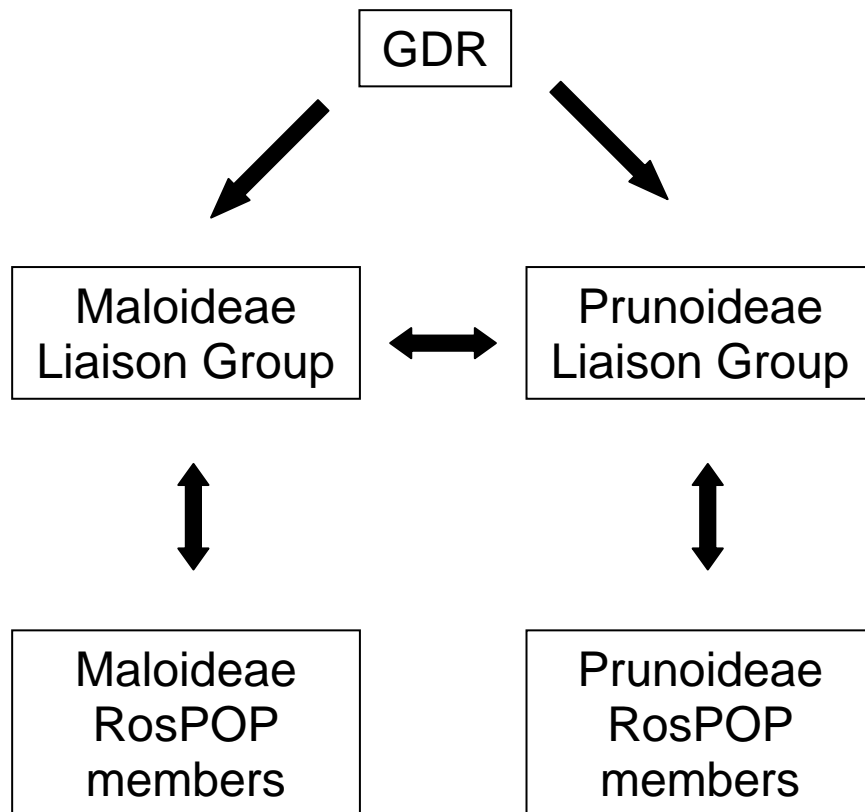
- And to provide access for existing tools for whole of Rosaceae Community
- Phenotype database - establishing a database that would include old cultivar phenotypes and lineages as well as key mapping populations

### 3. Resource and data sharing – how can we work together?

- Germplasm stock centres – wild and commercial germplasm
- Biological resources centres – mutants, ESTs, clones, vectors, BACs, etc
- National and international consortia – i.e mapping populations consortium (see below proposal of Pere Arus)
- Open source software
- Shared databases (GDR)
- Standards and ontologies

### A proposal from Pere Arus for an initial concrete collaboration was discussed (RosPOP):

- Aim:** To get a more efficient use of what already exists through facilitating access to plant material and populations.
- How:** Developing and accepting ‘good will’ agreements for plant material, DNA/RNA, etc
- Declare which populations are in, but use of these populations should not imply a charge - dollars or authorships.
- Certain quality parameters for the populations included in RosPOP should be established (number and positions of common markers to the TxE map in the case of Prunus).
- Members are those who can contribute one or more populations.
- Benefits:** Broadening of current capabilities.  
Greater use of existing populations.  
Possibility for funding for maintenance of populations.  
Facilitated exchange of materials.
- Implementation:** Develop and write agreement.  
Post on GDR.  
Create committee to oversee.
- Structure:**



The Maloideae Liaison Group will be led by Chuck Simon and the Prunoideae Liaison Group will be jointly led by Werner Howard and Cameron Pearce.

One of the aims is to work together to further saturate the *Prunus* Tx E map with sequence derived markers.

There was then a discussion on various topics: who could be members (needed to have a population with markers), ultimate size (start small and broaden as it develops), sharing contacts and access to data, acknowledging previous contributions and that difference people has difference things to contribute.

Other ideas for collaboration included:

**Genetic mapping and markers:**

- Need for two sets (or nested levels) of spaced microsatellite markers to improve coverage across linkage groups – all markers do not segregate across all parental combinations used in mapping studies; could start this one quickly in apple as already funded (HiDras)
- Need information on ms alleles across a cultivar set; DNA from this set should be available to all from central source – who?
- Useful to register interest in marker development from specific genes on a website – several current possibilities for this (HiDras; GDR).

**Bioinformatics:**

- Need to connect bioinformatics systems across community – the wheel keeps getting reinvented, wasting scarce resources; different systems have different strengths that we should share to increase rate of progress
- Attitude now changing on database sharing – may well be possible to action (task for steering committee?)

#### **4. Community-wide organisation:**

To act as group for political voice/power

#### **RosIGI – International Rosaceae Genomics Initiative will be co-ordinating body for international Rosaceae Community.**

Need to work together to develop a white paper in order to secure funding.

Amy Iezzoni spoke on the experience of the US Rosaceae Community (RosEXEC) in developing their community white paper over the last few months

It was a strategic planning document that:

Defined research priorities  
 Fostered interaction between researchers  
 Defined research priorities  
 Interaction with end users

Identified key industry issues:

- Improve fruit quality
- Decrease pesticide use
- Lower energy inputs
- Produce stress tolerant plants

RosIGI should develop its own list of issues, these might well include these issues; there might be others at the international level. Material from this workshop will be used in development of the RosIGI White Paper

A committee was developed to assist Bert Abbott to continue to develop the White Paper for RosIGI.

Jasper Rees  
 Sue Gardiner  
 Pere Arus  
 Julie Graham  
 Amit Dhingra  
 Tom Davis  
 Bert Abbott  
 Angela Baldo  
 Herman Silva  
 Thomas Debener  
 Dan Sargent  
 Francois Laurens

Eric Van De Weg  
Ryutaro Tao  
Elizabeth Dirlewanger  
Chales-Eric Durel

The International White Paper will be developed using Wikisource – Angela Baldo will provide support for this; it could be hosted at UNH (Vladimir Shulaev)

A steering committee was appointed for RosIGI (Sue Gardiner – Co-ordinator)

US Schuyler Korban  
Bert Abbott  
Vladimir Schulaev

Europe Pere Arus  
Eric van de Weg  
Elisabeth Dirlewanger

Japan Toshiya Yamamoto

New Zealand Sue Gardiner

South Africa Jasper Rees

South America Lee Meisel

China Ming Liang Xu  
(Zhongshan Gao nominated after meeting)

Industry (Jim McFerson, Allan White nominated after meeting)

## **5. Reduction to Practice – how to translate discoveries into products**

Jim McFerson presented a summary on the Fruit Industry Future

Urgency - consolidation/globalisation  
- fruit production as a business

Strategic Planning - production and marketing  
- sustainability  
- technology  
- fruit quality  
- production efficiency  
- crop health  
- stress tolerance

Generate basic knowledge for the future – curiosity research. Don't worry about down-stream applications.

Work with applied colleagues

SO – plan urgently and strategically

- collaborate internationally
- get producers to conference
- get growers enthused

Other discussion focussed on the need for research to be led by consumer requirements and by pressure to develop products that will have a competitive edge in the global food market.

6. Funding strategy – it was agreed to leave this issue to the steering committee

Next conference in Pucón, Chile in March 2008