Living on the edge:
the narrow genetic base of the rootstocks
is a serious threat

Daniel Pap GBG2018

VITICULTURE & ENOLOGY
UNIVERSITY OF CALIFORNIA DAVIS

VITIS ROOTSTOCK - Narrow genetic base?

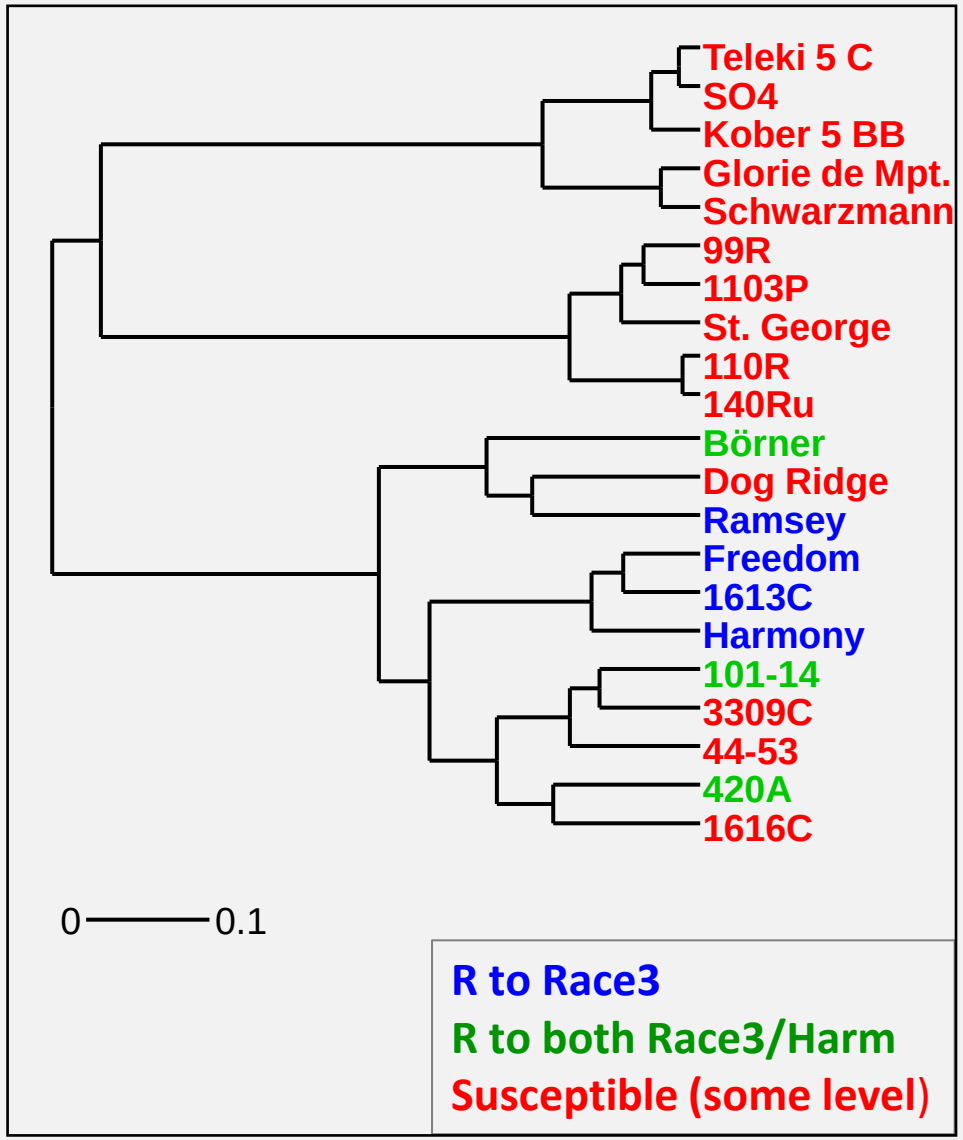
Gloire de M., Rességier 2, du Lot contribution to the total genetic background is 40%

Chloroplast haplotype diversity limited – few mother lines

In California: minimal requirements are: Root-knot nematode resistance, Phylloxera resistance

Principal Coordinate Analysis of Rootstocks and Reference Species

Root-Knot Nematode Resistance and Pathotypes



Pathotype ID	*Species*
Race3	*M. incognita*
Harmony-C	*M. incognita*
Harmony-A	*M. arenaria*

Rootstock	Parentage
UCD GRN1	*V. rupestris* cv A. de Serres, *M. rotundifolia* cv Cowart
UCD GRN2	*V. rufotomentosa, V. champinii* cv Dog Ridge, *V. riparia* cv Riparia Gloire
UCD GRN3	*V. rufotomentosa, V. champinii cv* Dog Ridge), *V. champinii* cv c9038, *V. riparia* cv Riparia Gloire
UCD GRN4	*V. rufotomentosa, V. champinii cv* Dog Ridge), *V. champinii* cv c9038, *V. riparia* cv Riparia Gloire
UCD GRN5	*V. champinii* cv Ramsey, *V. champinii* cv c9021), *V. riparia* cv Riparia Gloire

Based on Ferris et al 2012

Nematode mapping efforts (on going)

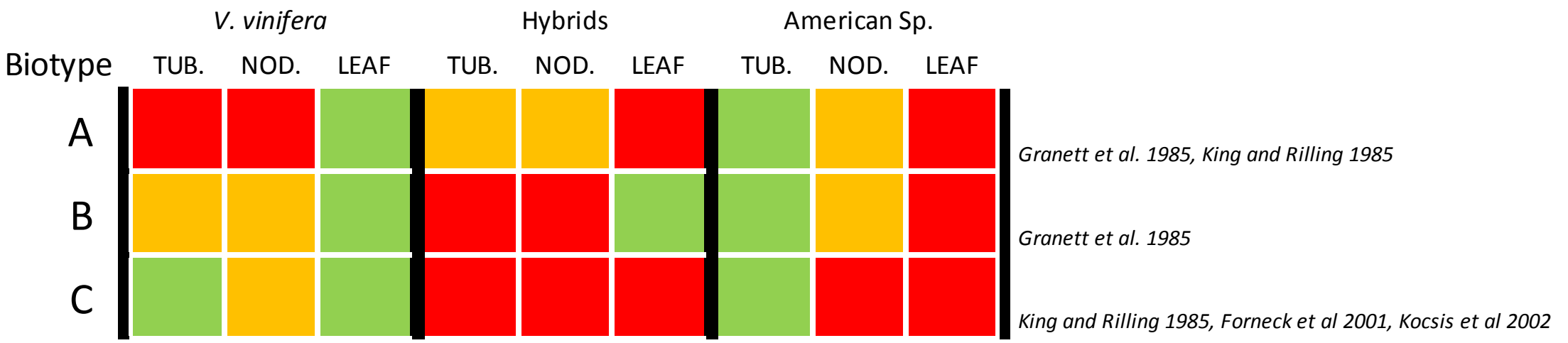
RKN screen in the greenhouse

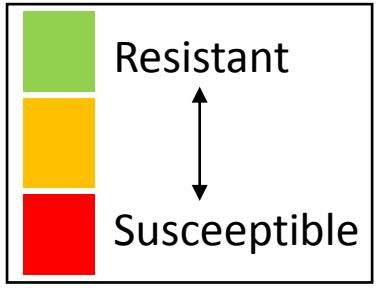
- **Resistance on Chr 18 (GRN2 / GRN4 / GRN5)**
  (based on Bulk Segregate Analysis)
- **MJR1 – Chr18 - *M. javanica* (Smith et al. 2018)**
  ***V. cinerea* accession**
- **Expanded mapping populations:**
  GRN2/GRN4/GRN5
- **New mapping populations**
  ***V. cinerea* / *V. arizonica*: b41-23, b45-26**

Phylloxera Biotypes – and Resistances?

Astrid Forneck et al 2016 AJEV

Biotype differentiation according to host performance





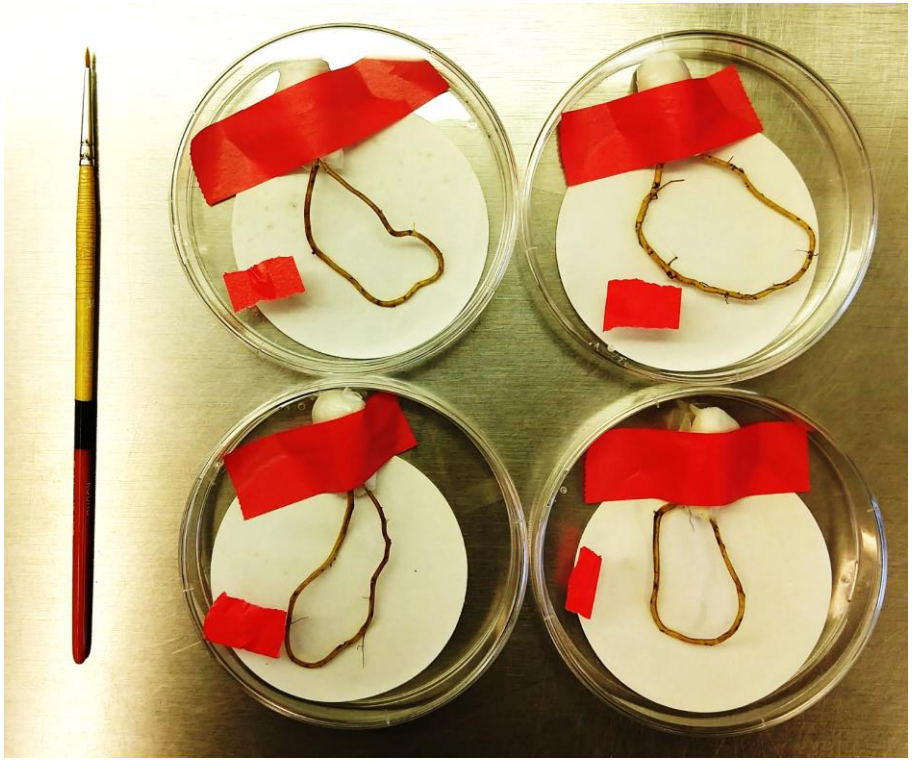
- **AXR#1 break down in California (B biotype)**
- **Teleki 5C virulent phylloxera in EU**
- **Quick spread of New – leaf feeding from in CA**

Resistance to B biotype

***V. vinifera* F2-35 × *V. arizonica-girdiana* b42-26**

Map generated for

Pierce's Disease R mapping



Excercised roots in Petri dishes

RDV2 identified on Chr18

Greenhouse evaluation in perlite filled bins

Californian Foliar Phylloxera

- **This biotype feeds on roots (for e.g. 1103P roots)**
- ***V. vinifera* F2-35 × *V. berlandieri* 9031**
- **Segregates 1:1 for (pseudo)Tuberosity in excised root assays**

Trait: not feeding through the cortex of the root, but allows feeding on root tips, callus tissue (Nodosity)

Summary

- **Narrow genetic base of the existing rootstock is a threat**
- **Need for new resistance sources**
- **Need for understanding genetics of resistances**
- **Establish marker assisted selection**
- **Need to keep up with the everchanging pest**
- **We should not forget to look below ground**

Acknowledgement

Summaira Riaz

Nina Romero

Rebecca Wheeler-Dykes

M. Andrew Walker

Karl Lund

Astrid Forneck

Funding Sources

California Grape Rootstock Improvement Commission

California Grapevine Rootstock Research Foundation

CDFA Improvement Advisory Board

California Table Grape Commission

Louis P. Martini Endowed Chair funds

VITICULTURE & ENOLOGY

UNIVERSITY OF CALIFORNIA DAVIS