Rootstock Trials
In Wine Grapes

Markus Keller
WA rootstock challenges

- Industry expansion mostly in “new territory”
- Most (99%) vineyards on own roots
- Most wine grapes drip-irrigated (RDI)
- **Phylloxera** discovered in WA in 1894 but still localized (spreading in OR since 1990) → Industry vulnerable!
- **Crown gall** problematic, **nematode** pressure increasing
- **Cold injury** threat in eastern WA
- **Vigor** and **ripening** concerns in western WA
The WA rootstock project

- Industry rootstock task force assembled in 1992: *Recommendation that WSU evaluate rootstocks*
- Rootstocks received from Cornell University in 1996
- Micro-propagation for crown-gall and virus elimination at WSU
- Rootstock *field trial* planted at WSU in 1999
- Field grafting in 2002 and 2003 (transition, cold damage)
Grafting success and failure

- Chip budding in June/July
- Freeze on October 31 (10°F)
- Most rootstocks are cold-hardier than European wine grapes
- No rootstock effect on survival except 99R: long vegetative growth period, slow acclimation
  → Avoid in risky climate!

28” → 99% take → 71% survival

10” → 91% take → 20% survival
• No rootstock effect of scion phenology
• Own-rooted Merlot and Chardonnay had greater growth capacity than grafted vines
• Spatial variation (soil differences) dominant over temporal variation
• $\Psi_s$ trend: higher on 3309C, lower on 5C

Keller et al. (AJEV, 2012)
Vigor and vine size

**Optimum:** 0.3-0.6 kg/m (0.2-0.4 lbs/ft)

- **Merlot**
- **Syrah**
- **Chardonnay**

**Vigor (literature):**
- moderate
- high
- mod.-high
- low-mod.
- unknown

- No rootstock enhanced vigor (except, slightly, 3309C in Syrah)
- Vine size (pruning weight) near or below optimum
- Pruning weights positively correlated from year to year (small vs. big vines)
• Large annual variation: Merlot 2.3-fold, Syrah 2-fold, Chardonnay 1.3-fold
• Highest yields on 3309C/5C (Merlot), 3309C (Syrah), own roots/5C (Chardonnay)
• Rootstock effect mostly due to differences in clusters/vine and berries/cluster
• Merlot, Syrah: larger berries on 3309C
- Annual variation dominant (vintage effect)
- No rootstock effect on soluble solids, titratable acidity (TA), anthocyanins, skin and seed tannins
- pH variation at harvest driven equally by variation in TA and K+
- Own-rooted Merlot and Chardonnay had higher juice K+ and pH than grafted vines
No conclusions without winemaking

- WSU research winery
- 10 Field reps. → 5 winemaking reps.
- Harvest at commercial maturity
  (> 23.5 Brix, except 2008: 22 Brix)
- Fermentation of ~50 kg fruit in 100-L (Chardonnay) or 300-L (Merlot, Syrah) stainless steel tanks
- DAP and superfood addition
- **Whites**: Direct to press, no MLF
- **Reds**: Crush/destem, 8 d skin contact, 2 punchdowns/d, primary
- SO2 and cold stabilization
- Filtration before bottling
Wine composition

• Annual variation dominant (vintage effect!)
• Inconsistent and minor rootstock effect on ethanol, TA, and anthocyanins
• Wines from own-rooted vines had higher K+ and pH
  → Canopy density effect?
  → Own-rooted Merlot and Chardonnay grew more shoots
• Red wines from own-rooted vines had 12% higher tannin concentration
• In this case, statistically significant differences are of little practical consequence

Harbertson & Keller (AJEV, 2012)
Conclusions

- Rootstock effect on yield depends on scion, soil, weather
- Rootstocks have minor effects on vine growth (own-rooted vines with greater capacity), and fruit and wine composition
- Growth in dry climates determined by temperature variation and limited by water availability (soil, RDI…)
- Fruit and wine composition determined by scion cultivar and weather (vintage effect)
- Avoid rootstocks with long vegetative period in WA

When growth is controlled by water deficit, grafted vines produce wines of similar quality to own-rooted vines, despite some differences in growth and yield formation.
Acknowledgments

- **Funding:** WA Wine Commission
  WSU Agricultural Research Center
  Northwest Center for Small Fruits Research
- **Advice:** WA Wine Advisory Committee
- **Project initiation:** Robert Wample, Sara Spayd
- **Project Co-PI:** James Harbertson
- **Vineyard support:** Lynn Mills, Alan Kawakami,
  Celia Longoria, student interns
- **Grafting:** Shayne Hackett
- **Winemaking:** Sandra Wran
- **Lab support:** Maria Mireles, Eric Harwood
- **PNW input:** Patricia Bowen, Patricia Skinkis, Krista Shellie