

# **Bud dormancy: Transitions**

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•	Dormancy starts around veraison and 4-8 weeks after shoot browning,	but
	neither veraison nor shoot browning are coupled with dormancy onset	

- > Time of veraison is driven by <u>temperature</u> (*variable*, ±3–4 weeks)
- > Time of dormancy onset is driven by <u>daylength</u> (~13 hr in PNW, stable)

• Chilling (30–60°F) or heat								
<b>shock</b> (105–120°F) lift dormancy → Enables budbreak at >50°F	Variety	Year	Veraison	Dormancy		Dudbrook		
				Onset	Release	Duubieak		
	Chardonnay	2013-14	Aug 14	Sep 6	Oct 31	Apr 17		
• Budbreak can occur any time after dormancy release		2014-15 2015-16 2016-17	Aug 26 Jul 22 Jul 26	Sep 2 Sep 5 Aug 31	Oct 26 Nov 3 Oct 21	Mar 26 Apr 9 Apr 20		
Times of dormancy release and budbreak are both driven by temperature (variable)	Cabernet Sauvignon	2013-14 2014-15 2015-16 2016-17	Aug 21 Sep 5 Aug 15 Aug 11	Sep 4 Aug 26 Sep 4 Aug 29	Nov 2 Nov 5 Nov 4 Oct 27	Apr 24 Apr 8 Apr 13 May 5		
temperature (variable)				Ca	margo Alvare	ez et al. (2020)		

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- · Warm temperatures: Sugar converts to starch to prevent cell flooding
  - $\rightarrow$  Deacclimation

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Eifert et al. (1961); Halldorson & Keller (2018)









## Diurnal danger: No fun in the sun





Peña Quiñones et al. (2019)

- Trunks are warmer than air during the day (sunshine!) and colder than air at night  $\rightarrow$  9-14°F greater diurnal range
- · Snow cover exacerbates trunk warming, especially on SW side
- Day: Deacclimation; Night: Reacclimation (slow cooling) or freezing (rapid cooling)
- Bark (phloem) injury is repaired unless cambium is damaged
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### Tube danger: Move those tubes



- Field trial: 21 scion–rootstock combinations (3 × 7)
- Field-grafting (chip budding) in early July
- Freeze on 31 Oct (10°F)
- No rootstock effect (but 99R)
- Grafts at **28**": 99% take, **71%** survival
- Grafts at **10**": 91% take, **20%** survival
- Lower night temperatures inside grow tubes  $\rightarrow$  Remove tubes
- Grafting: Most rootstocks are cold-hardier than Vitis vinifera
- · Field-grafting at greater height may increase success
- Rootstocks, graft union: Minimal effect on scion hardiness



Keller et al. (2007)

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### Enemy within: Living with crown gall

- Agrobacterium vitis survives only in grapevine tissues (mostly xylem), no symptoms
- · Introduced into vineyards via contaminated planting material
- Trunk injury (cold damage, equipment)  $\rightarrow$  Xylem rupture releases bacteria
- Bacteria hijack wound healing response (GMO)  $\rightarrow$  Callus turns into tumor  $\rightarrow$  Crown gall symptoms
- Retrain symptomatic vines from asymptomatic suckers
- Bacteria persist in root debris for years  $\rightarrow$  Remove roots before replanting
- *Vitis vinifera* is highly susceptible to *A. vitis*, but *V. riparia* and *V. rupestris* are relatively tolerant → Rootstocks (but grafting = injury!)



 Symptoms look like water stress – because it is

### **Budbreak: Critical temperatures**

- Cold hardiness decreases with water content (45% → 80% during budswell) and from primary to secondary to tertiary bud
- Lethal temperature (LT) at budbreak:

Growth stage	LT <sub>50</sub> (°F)			
Late dormancy	<15			
Woolly bud	26			
Budbreak	28			
1 <sup>st</sup> Leaf	28.5			
2 <sup>nd</sup> Leaf	29			



- Bud temperature: 2–3°F warmer (day) or 2–5°F cooler (night) than air if wind <2 miles/hr
- Delay (spur) pruning to delay budbreak

Gardea (1987)



- Before pruning: Assess bud cold damage and primary bud necrosis (Syrah)
  - $\rightarrow$  Retain more buds to compensate for lost yield potential
  - $\rightarrow$  Use minimal pruning if >75% dead buds
  - $\rightarrow$  Shoot-thin to target shoot numbers if desired
- · Bare spur positions: Renew cordon by removal or (short) kicker canes
- Avoid early-season water stress to prevent canopy collapse

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