Bud Dormancy Trends of Vine Clippings

A survival analysis of bud break on Chardonnay and Cabernet Sauvignon vines

Background Information

- Key Terms
  - Bud Break
    - Beginning of photosynthesis
    - End of winter
  - Cultivar
  - Forcing
- Why is this important?
  - Frost Injury prevention:
    - Wind machines, sprinkler systems, delayed pruning
  - Growing, harvest, and production scheduling
  - Climate Change

Goal of the Study

- What is the typical dormancy period for Chardonnay and Cabernet Sauvignon cuttings?
- Is the time to budbreak of Chardonnay and Cabernet Sauvignon significantly different?

Propagate Grape Vine from Cuttings

Grape vines are easy to propagate from cuttings. A section of the stem is cut, inserted into a potting medium and new roots sprout from the planted end of the stem.

Benefit

Select healthy vines
Select a particular strain of a cultivar
Save money

https://www.wikihow.com/Grow-Grape-Vine-Cuttings

Data and Methodology

Sampling Period
Vine clippings sampled weekly from August till December.

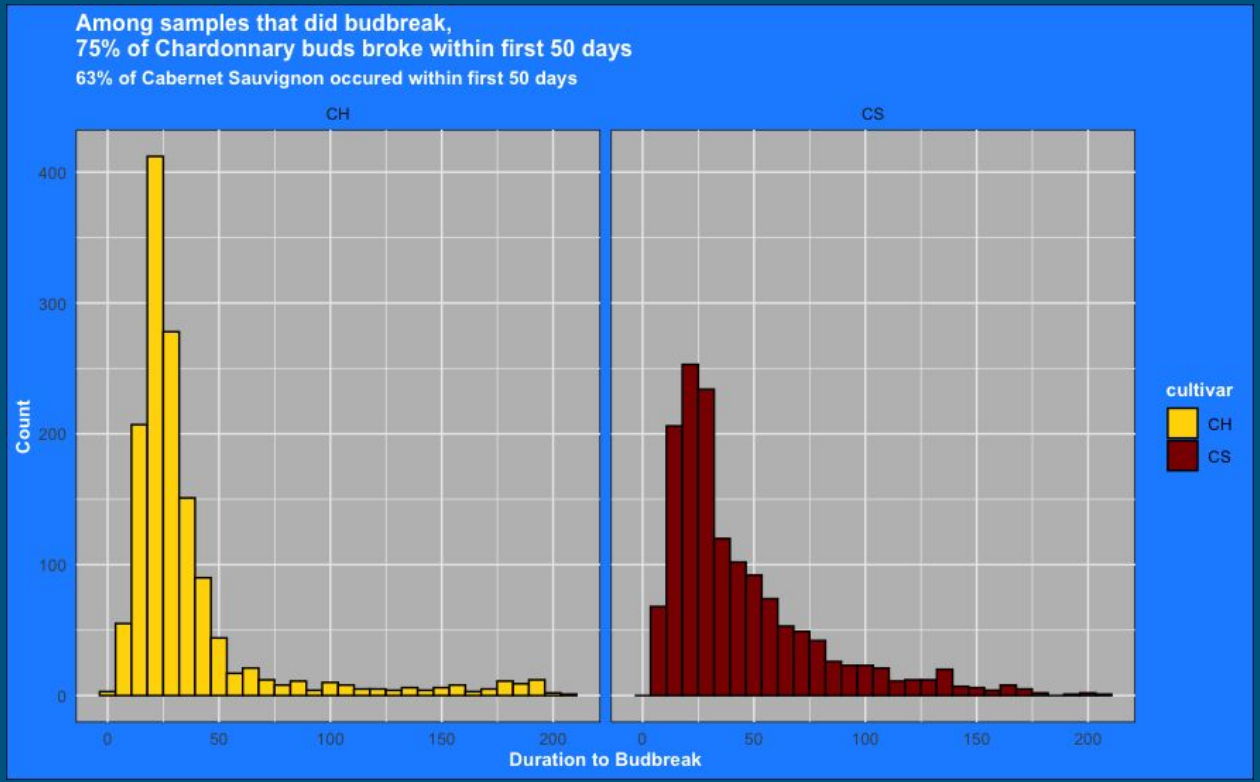
Observation Period
Clippings placed in growth chamber and observed every other day till March looking for signs of budbreak.

Analysis Period:
Once a green leaf tip is present in the buds, the duration to budbreak is recorded.

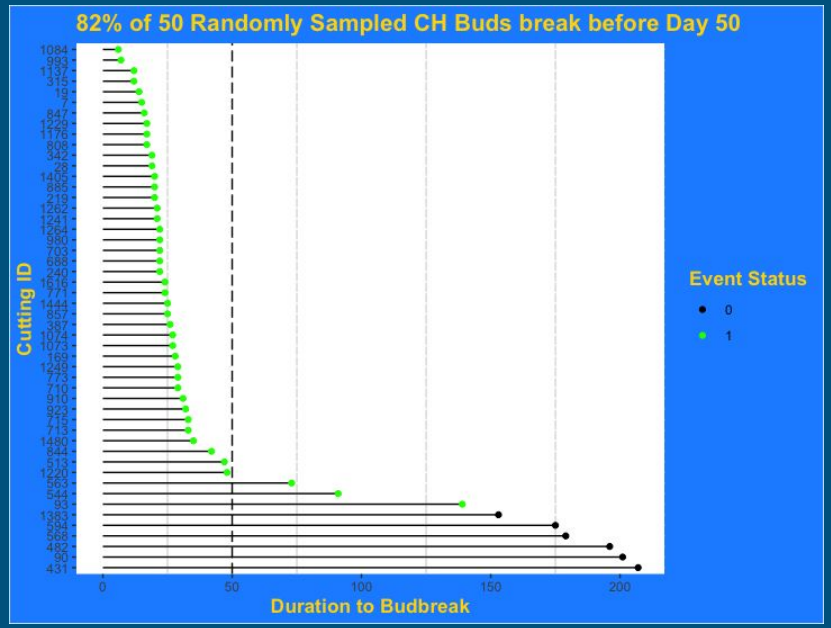
What Data?

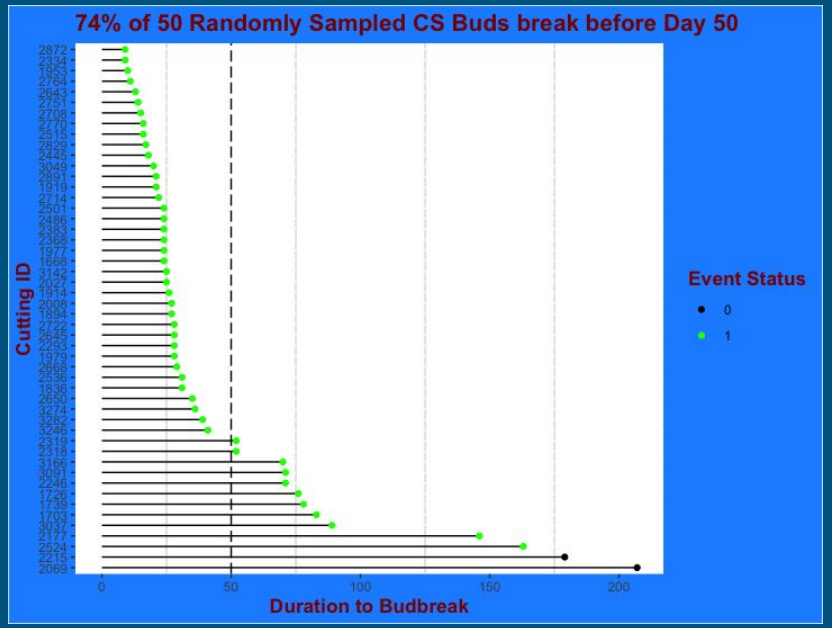
- 3,288 vine clippings collected between 2013 and 2016.
- Two different cultivars in the data: Chardonnay and Cabernet Sauvignon.
- Exactly 1,644 vine clippings from each variety in the data.
- Response variable: Duration to budbreak (Days).
- Experimental variable: Cultivar, Sampling Days of Year, Budbreak Day of Year, Censored Status.
- The data is right-censored, with 87.9% of the observations uncensored, 12.1% censored.

Comparing Distributions of Bud Break

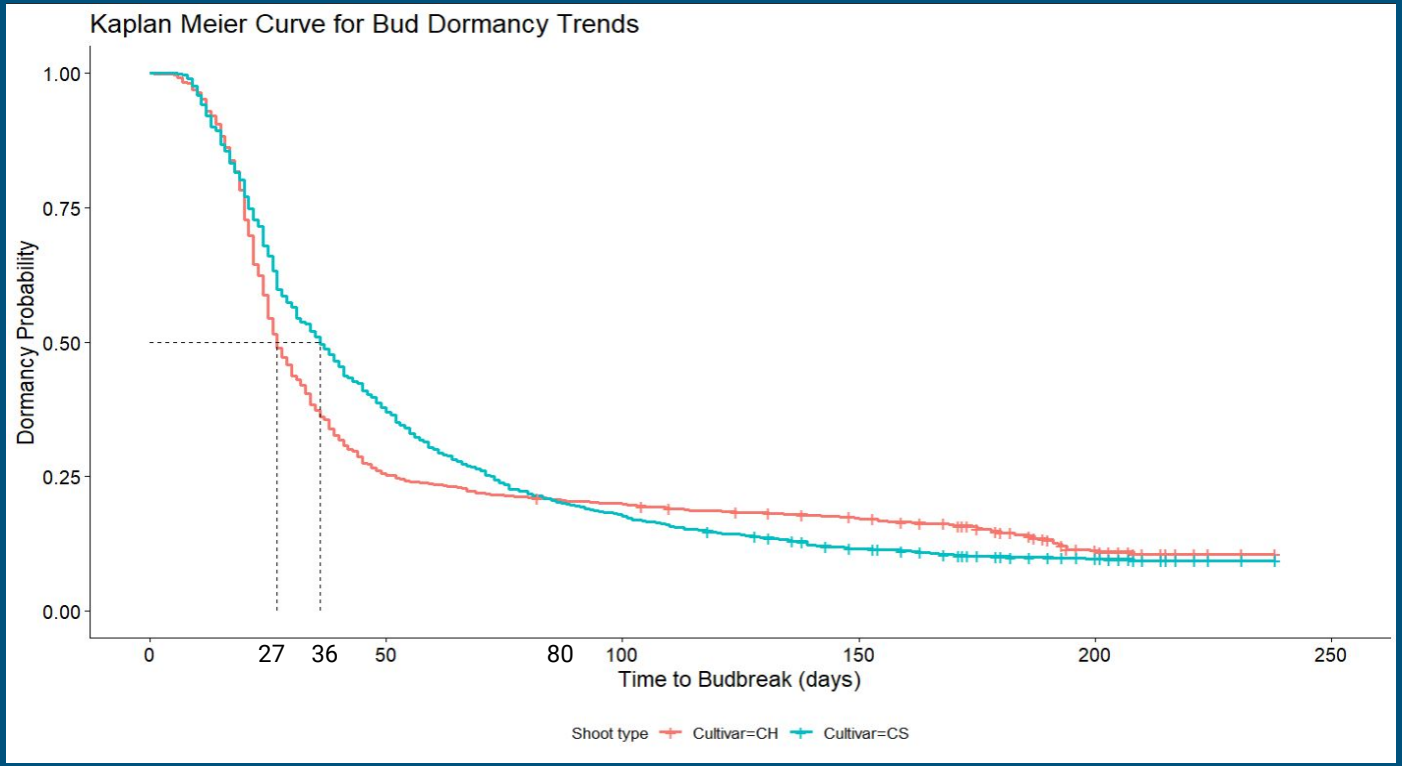


Comparing Bud Break Event Plots





Results - Kaplan Meier Curve



Explanation of Log Rank Test

≠

Null Hypothesis: There is no significant difference in the duration to budbreak between Chardonnay vines and Cabernet Sauvignon vines.

Resulting P-Value:

```
Call:
survdiff(formula = Surv(df$`Duration to Budbreak`, df$status) ~
    df$Cultivar)

                    N Observed Expected (O-E)^2/E (O-E)^2/V
df$Cultivar=CH 1644     1412     1358      2.18      4.25
df$Cultivar=CS 1644     1477     1531      1.93      4.25

 Chisq= 4.3  on 1 degrees of freedom  p= 0.04
```

Analysis: Given p = 0.04 , the null hypothesis is rejected. Therefore, there is a significant difference in time to budbreak between Chardonnay and Cabernet Sauvignon vines.

Conclusion

- According to the log-rank test, there is a probability of .04 that the difference in time to budbreak between CH and CS vine cuttings is due to chance.
- However, given our…
    - large sample size (n = 3288)
    - how close this p-value is to threshold of rejecting the null hypothesis,
    - similarity of budbreak distributions and randomized event plots

  we are cautious about asserting that time to budbreak between CH and CS is significantly different based solely on this statistical test.