Variability in flowering, fruit set and yield in response to vineyard topography and pruning type in Pinot noir

Chinna Ghouse Peera Shaikh Kulsum[1], Michael Trought[1], Hervé Quénol[3], Andrew Sturman[2], Don Kulasiri[1], Amber Parker[1]

[1] Department of Wine, Food and Molecular Biosciences, Lincoln University
[2] School of Earth and Environment, University of Canterbury
[3] CNRS, UMR 6554 LETG, Université Rennes 2, Rennes, France

Ghouse.ShaikhKulsum@lincolnuni.ac.nz

Introduction

Vineyard aspect, slope and altitude may all influence temperature and exposure to wind, which in turn affect vine yield and phenology. This study investigates the effects of site aspect and cane and spur pruning on variability in flowering, fruit set and yield in Pinot noir vines.

Methods

Site details:

- Waipara, North Canterbury (43°6’ South, 172°44’ East) (Figure 1).
- Pinot noir (clone UCD 6, rootstock Riparia Gloire), planted in 1997.

Experimental design: Two rows (blocks), six plots, two sub-plots, each sub-plot with one bay of four spur-pruned vines, one bay of four cane-pruned vines.

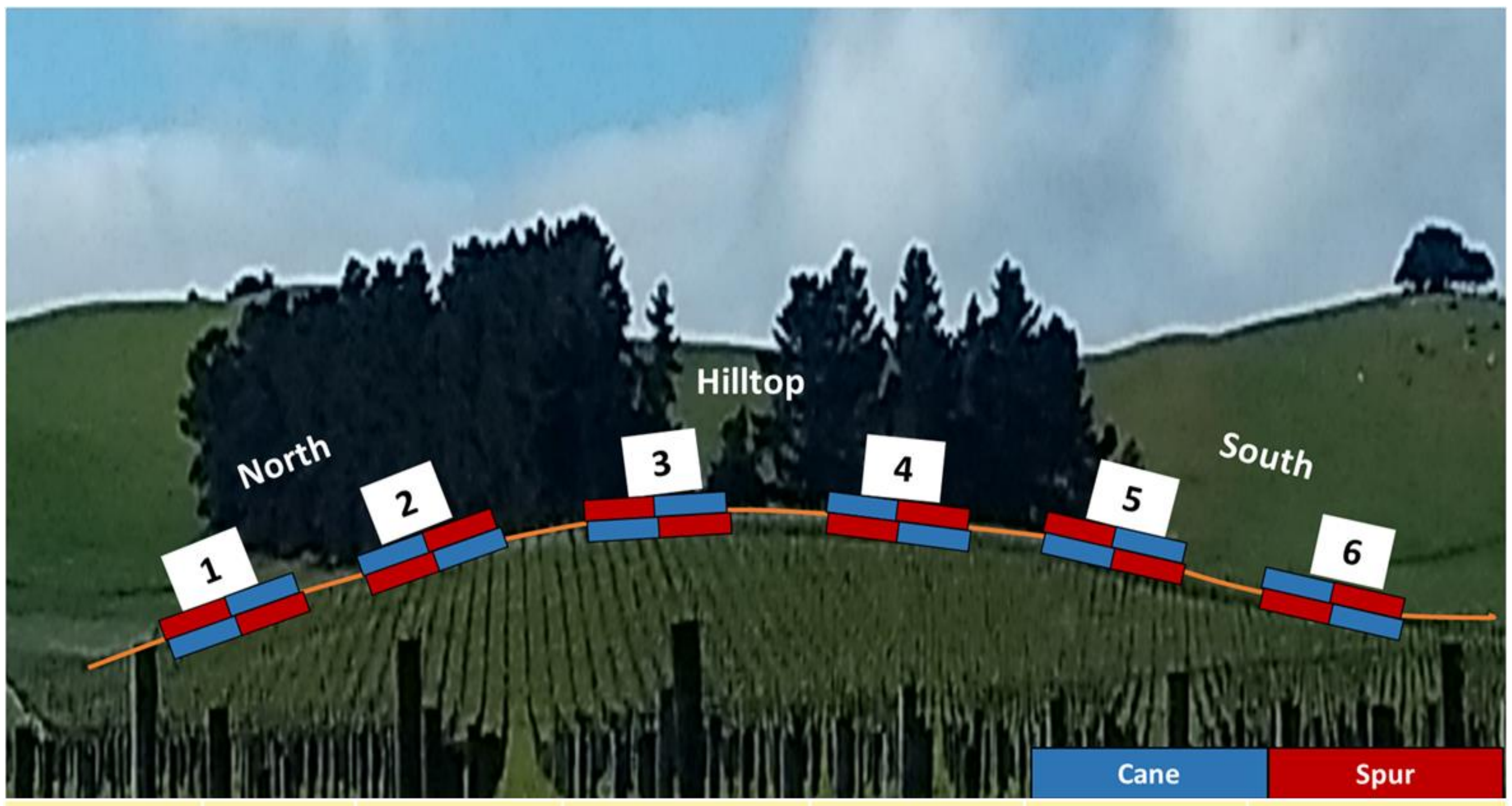
Measurements: Temperature at each plot, phenology (50% flowering and veraison), fruit set (%), total soluble solids, yield. Statistical significance at $p<0.05$ (Fisher’s unprotected LSD).

Results

- Degree day accumulation (base 10°C) shows seasonal differences in temperature among the six topographical locations with south plots (4, 5 and 6) warmer when compared to north plots (1, 2 and 3) (Figure 1).
- Flowering occurred earlier on south facing plots (5 and 6) when compared with other plots (1, 2, 3, and 4) in 2018/19 and 2020/21 (Figure 2A).
- While in the first two seasons, there were no differences in veraison, in 2020/21 vines in plots at lower altitude (1 and 6) were four days later for veraison compared with other plots (Figure 2B).
- Fruit set was lower in the most exposed site (plot 4) (Figure 3A). Vine yield was lowest at north (1) and south (6) plots in 2020–21 (Figure 3B), but there was no consistency in yield trends for pruning type or topography over the seasons.
- In general, there were few differences in soluble solids at harvest (all seasons).
- The type of pruning (cane and spur) had little to no effect on timing of flowering and veraison, fruit set, soluble solids at harvest.

Conclusions

- Initial differences in the dates of flowering and veraison caused by topography (site aspect) were not reflected in soluble solids at harvest.
- Fruit set was variable in response to topography but differences in vine yield were not consistent with pruning and topography across the seasons.
- Vineyard microclimate is affected by slope, aspect and topography. Understanding the extent to which factors like temperature, wind, and soil moisture influence vine yield and phenology improves our ability to manage vineyard variability.



GDD_{10}	1	2	3	4	5	6
2018-19	1156	1310	1227	1384	1289	1276
2019-20	1112	1100	1056	1214	1362	1378
2020-21	1221	1255	1427	1610	1527	1516

Figure 1. Trial site looking east. Pruning system: C = Cane (blue coloured), S = Spur (red coloured), both Vertical Shoot Positioned (VSP). Topography: North = sites 1 & 2, Hilltop = sites 3 & 4, and South = sites 5 & 6. GDD_{10} = Growing degree days calculated for the period 1 Oct - 30 April with base temperature of 10°C.

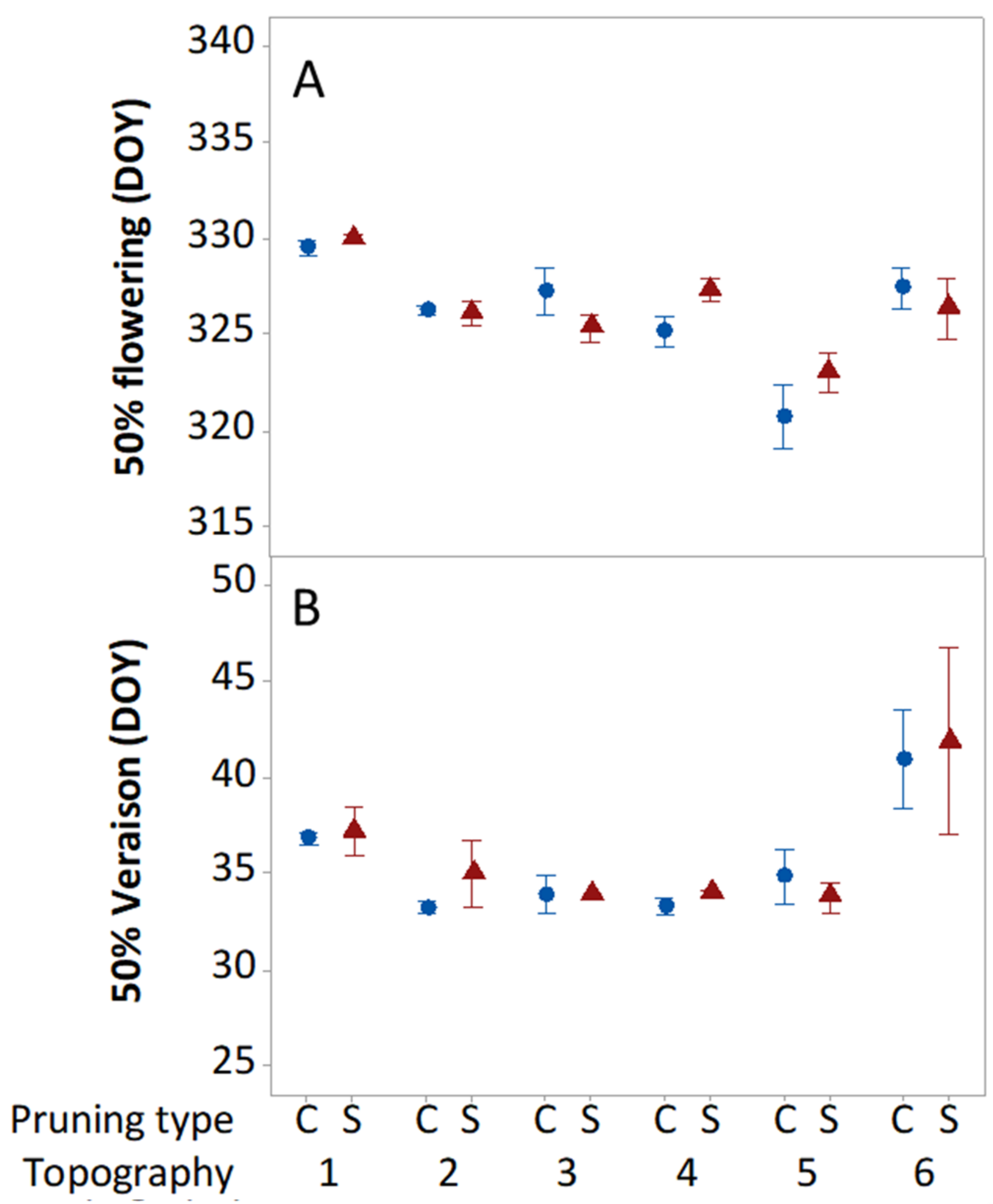


Figure 2. Day of the year (DOY) A. 50% flowering, B. 50% veraison at six sites in cane-pruned and spur-pruned vines for 2020/21. Error bars = standard error of the mean. Pruning system: C = Cane (●), S = Spur (▲). Topography: North = sites 1 & 2, Hilltop = sites 3 & 4, and South = sites 5 & 6. $p<0.05$ for topography.

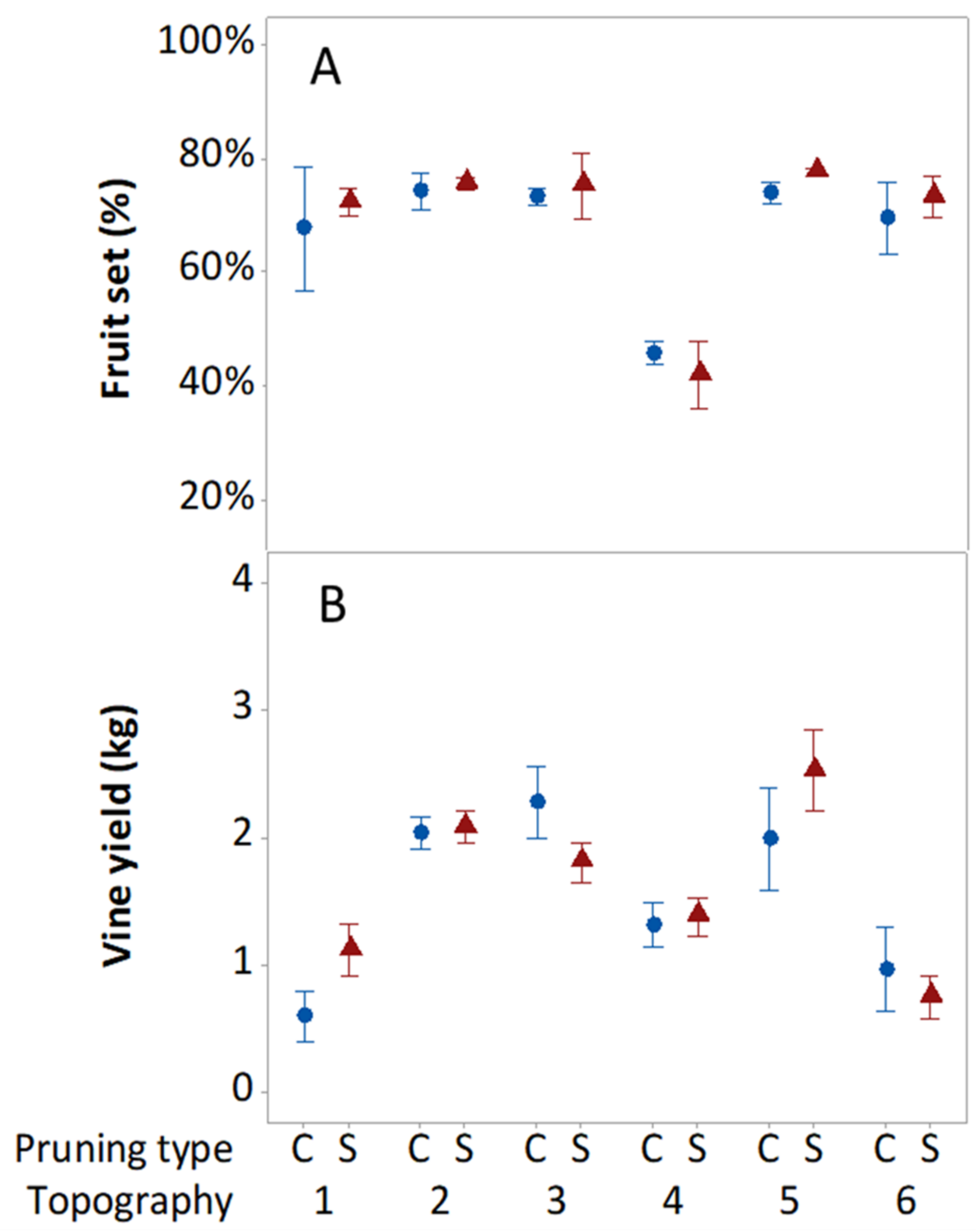


Figure 3. A. Fruit set (%), B. Yield per vine (kg) at six sites in cane-pruned and spur-pruned vines for 2020/21. Error bars = standard error of the mean. Pruning system: C = Cane (●), S = Spur (▲). Topography: North = sites 1 & 2, Hilltop = sites 3 & 4, and South = sites 5 & 6. $p<0.05$ for topography.

Acknowledgements

The authors would like to acknowledge support from the Precision Grape Yield Analyser, a research programme led by Lincoln Agritech Ltd with project partners Lincoln University, University of Canterbury, Plant and Food Research and CSIRO, that receives major funding from the Ministry of Business, Innovation and Employment through an Endeavour programme (LVLX1601). Financial support provided through the Bragato Research Institute is also acknowledged, as well as provision of the trial site by Pernod Ricard (NZ). We are grateful for access to the field site and ongoing field assistance at Camshorn vineyard from Julian Gibbs, Andy Harris and Andrew Naylor.

UC UNIVERSITY OF CANTERBURY Te Whare Wānanga o Waitaha CHRISTCHURCH NEW ZEALAND

LINCOLN UNIVERSITY Centre for Viticulture & Oenology

LINCOLN AGRITECH LTD