

Authors: Cameron Stone, Dugald Close, Sally Bound



Microclimate under protected cropping systems for sweet cherry

Protected Cropping Systems

A protected cropping system (PCS) is defined as a cover over a horticultural crop that protects the crop. The VOEN PCS has been designed with the inclusion of vents that are displaced in the presence of wind. These aim to ameliorate excessive heat and/or humidity.

New microclimates

The microclimate beneath PCS is not typical of normal orchard environments. This study found only moderate increases in relative humidity and temperatures, slight reduction in solar radiation and significant (four-fold) reductions in wind speed (Figure 1).

Tree water uptake

Average daily tree water uptake under the VOEN PCS was three times lower than in trees under bird netting. Higher average relative humidity levels and reduced wind speeds are thought to have contributed to these results (Figure 1).

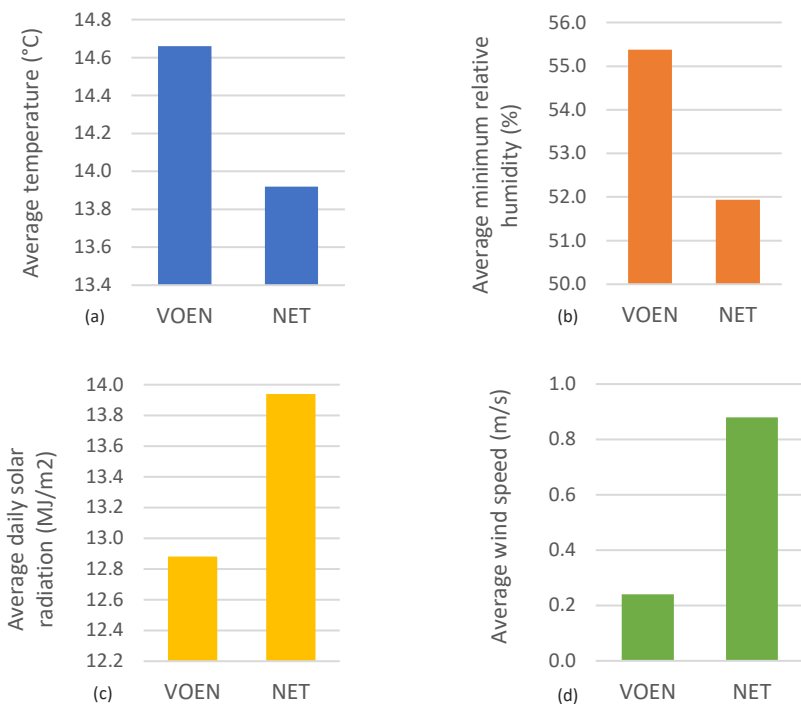


Figure 1: Temperature (a), relative humidity (b), solar radiation (c) and wind speed (d) differences under a VOEN and netted cherry block in Grove, Huon valley Tasmania in 2019-20.

KEY POINTS

- **Vented PCS reduced wind speed** four-fold compared to bird netting
- **Vented PCS reduced tree water use** three-fold compared to bird netting
- **Improved fruit quality** was associated with moderate increases in temperature under vented PCS
- **Vented PCS** can create a stable environment conducive to optimal fruit development and quality.

Fruit quality under vented PCS

Better fruit quality further under the PCS in contrast to near the PCS boundary

Microclimate, tree water uptake and fruit quality analysis were examined at four different locations (Table 1) under a large (21 ha) PCS over Staccato on Colt rootstock in the Derwent Valley, Tasmania, Australia.

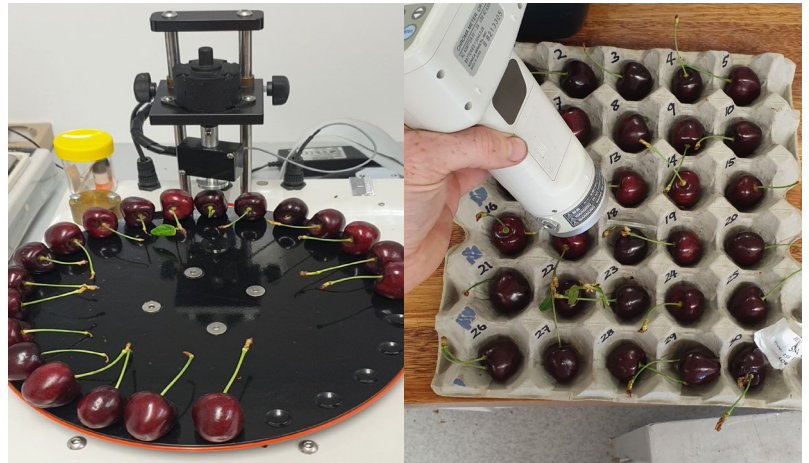
Table 1: Elevation and distance of the four assessed locations under a 21-ha vented PCS.

Location	Elevation above sea level (m)	Distance under PCS (m)
1	125	105
2	114	75
3	111	60
4	102	50

Compression firmness and total soluble solids

Fruit was significantly firmer with higher dry matter and total soluble solids contents at location 1 (furthest from PCS boundary) in contrast to fruit from location 4 (closest to PCS boundary).

The improved fruit quality at location 1 (furthest from the PCS boundary) was associated with warmer average maximum temperatures (+3.3°C) and lower average minimum relative humidity (-1.2%) compared to location 4 (closest to the PCS boundary). (Figure 2).



Fruit quality analysis: Measuring fruit compression firmness with a Bioworks FirmTech (left) and fruit colour using a Minolta Colourimeter (right).

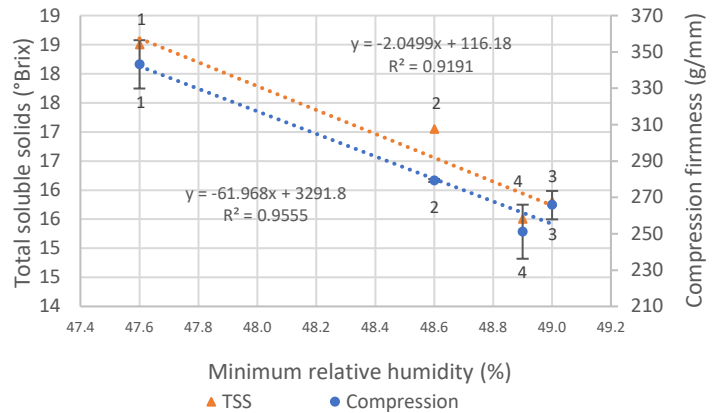


Figure 2: Fruit compression firmness and total soluble solids (TSS) for each of the four locations listed in Table 1.

Dry matter content

Higher fruit dry matter content was associated with locations further under the vented PCS (Fig 3).

The warm stable environment further under the PCS created the ideal environment for fruit development.

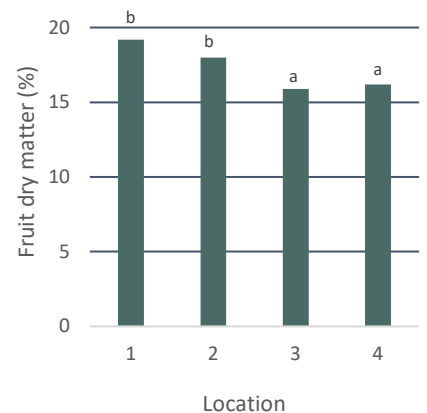


Figure 3: Fruit dry matter content for each of the four locations listed in Table 1. Different letters above bars indicate differences between locations

For more information please contact: Cameron.stone@utas.edu.au | utas.edu.au/tia

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