



Effect of crop load management and canopy architecture on yield and fruit quality of late-season plum 'Angeleno'

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Introduction

The Australian summerfruit industry has identified that sales growth is impeded by low consumer satisfaction with fruit quality, leading to low prices and static consumption. Crop load is known to affect fruit size but few studies have been reported on fruit quality.

The objective of the study was to identify crop load management practices, under Tatura Trellis and vase training systems, to enable 'Angeleno' plum to maximise uniformity in fruit quality attributes.

Methods

Different manual thinning regimes were implemented in season 2016/17 to establish the following crop load treatments: (1) high: minimally thinned; (2) medium (commercial standard as control): moderately thinned and; (3) low: heavily thinned.

Results & Discussion

Larger canopies occurred on Tatura Trellis compared to vase, despite identical tree density and age. Higher canopy radiation interception (f_{PAR}), provided capacity to support greater fruiting levels and high yields (Table 1). Mid-season f_{PAR} was ~68% under Tatura Trellis compared to ~52% for vase trees. Crop load did not affect full bloom date or f_{PAR} for a given canopy architecture. Vase trees had over twice the pruning biomass of Tatura Trellis trees. Low crop load increased pruning weight.

Trunk growth was higher under low crop load on Tatura Trellis. Overall, high crop loads reduced fruit weight (Fig. 1) and lowered pack-out performance (Table 1). Irrespective of training and cropping level combination, fruit sweetness was high (≥ 17.2 °Brix), with low variability ($CV \leq 11\%$). Over half of all fruit grown on Tatura Trellis exceeded 18 °Brix, compared to $\leq 38\%$ on vase. For vase trained trees, fruit maturity and firmness were similar across crop load treatments. However, for Tatura Trellis training system, high cropping levels produced more immature and firmer fruit.

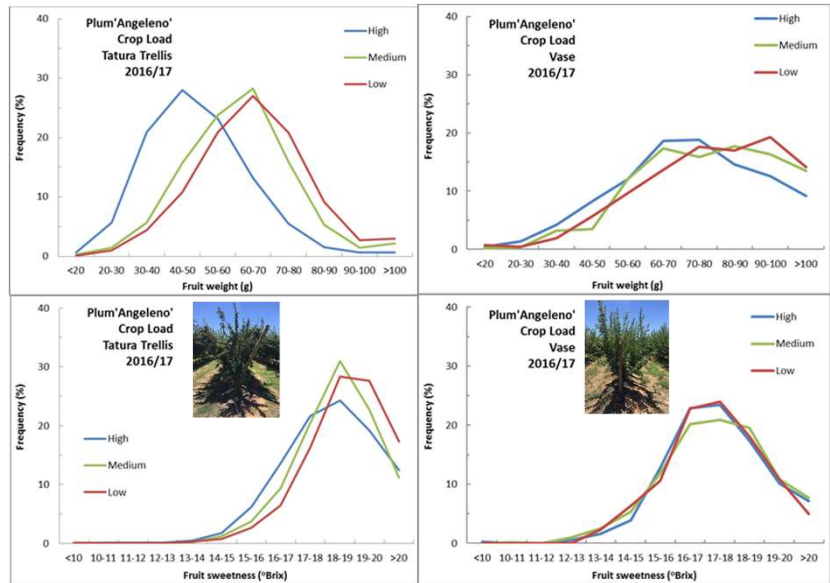


Figure 1. Distributions of final fruit weight and sweetness in response to crop load treatments (high, medium, low) of 'Angeleno' plum under two canopy systems (Tatura Trellis, Vase), Tatura, Australia, 2016/17 season. Tree density: 2222 trees/ha. Photos taken mid-season at solar noon.

Table 1. Production parameters in response to crop load treatments (high, medium, low) of 'Angeleno' plum under two canopy systems (Tatura Trellis, Vase), Tatura, Australia, 2016/17 season.

Treatment	Fruit number (fruit/tree)	Cropping level (Fruit/cm ² trunk cross-sectional area)	Yield (t/ha)	Fruit weight (g)	Export pack-out (%)	Fruit sweetness (°Brix)	Fruit maturity (I _{AD} value)	Fruit firmness (kgf)	Fractional daily radiation interception Summer 2017 (f_{PAR} , %)	Pruning biomass Season 2016/17 (g dry weight/tree)
Vase										
High	93	1.5	5.4	73 a	60	17.3	1.3	3.0	52	1,208 a
Medium	75	1.1	4.3	79 b	65	17.5	1.3	3.0	51	1,296 a
Low	53	0.8	3.1	80 b	71	17.2	1.3	3.0	53	1,528 b
ANOVA	ns	ns	ns	*	ns	ns	ns	ns	ns	**
Tatura Trellis										
High	423 a	16.7 a	46.7 a	51 a	10 a	18.2	1.2 a	3.0 a	69	324 a
Medium	260 b	10.1 b	35.5 b	62 b	26 b	18.4	1.2 b	3.1 ab	67	421 b
Low	177 c	6.4 b	25.8 c	66 b	38 c	18.8	1.1 b	3.0 b	69	513 c
ANOVA	***	***	***	***	***	ns	*	*	ns	***

ns, *, ** and *** indicate non-significant or significant differences at $P < 0.05, 0.01$ or 0.001 , respectively, for the two-way interaction crop load treatments. Export standard fruit criteria: fruit size, ≥ 70 g and sweetness, ≥ 12 °Brix.

Conclusion

This study showed the need for fruit thinning to ensure that plum fruit attains fresh market quality standards. The results identified canopy architecture and tree size govern photosynthetic capacity (source strength) to support an optimum fruiting level (sink size) that defines the yield limit within which the required premium quality attributes of fruit size and sweetness may be achieved. Further studies to measure within canopy effects of cropping levels and canopy architectures on fruit size, fruit quality and light interception are warranted.

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