NEW HORTICULTURE OPPORTUNITIES FOR THE GASCOYNE: IMPROVING THE GROWTH AND QUALITY OF CITRUS – THE FIRST HARVEST

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SUMMARY

Early season easy-peel navel oranges were grown inside and outside a protective structure to determine whether protective structures would improve tree growth, yield and quality of fruit. The first harvest occurred in April 2008, 2 years after the trees were planted. It was determined that navel oranges grown inside protective structures grew faster, had higher yields and a higher pack-out than navel oranges grown outside the protective structure. Future trials will examine canopy management to reduce wind rub blemishes further.

INTRODUCTION

The Gascoyne has an arid sub-tropical climate suitable for the production of many sub-tropical and tropical fruits but production is limited by damage from sunburn, wind and pests which are restricting orchard productivity and access to premium markets. The decline in red-fleshed grapefruit industry is an example of the impact environmental damage can have on a crop. In recent years the industry has halved in value and 30% of the growers have removed their trees because, despite Carnarvon being ideally placed to produce citrus with exceptional flavour, rind damage to fruit was rendering up to 60% of the crop unmarketable and growers could not meet the costs of production on such low returns.

Crop protection netting is used extensively throughout the world for the control of pests and environmental damage to fruiting crops. Benefits from protective netting over horticulture crops include increased crop reliability, reduced water usage and a reduction in pesticide usage. Production benefits include increased pack-out of first grade fruit as a result of reduced environmental damage. Agronomic benefits such as enhanced ripening resulting in earlier maturity may also occur.

In 2005 a protective structure was built at Gascoyne Research Station for tree crop research to enable the Carnarvon Horticulture Industry to improve product quality, access niche market opportunities and to facilitate diversification. The first trial to commence was to determine whether protective structures would reduce rind blemishes in thin-skinned easy-peel navel oranges and also improve tree growth, yield and quality of fruit. This paper reports the results from the first harvest.

MATERIALS AND METHODS

Three varieties of thin-skinned easy peel navel oranges, Newhall, Navelina, and CaraCara were planted inside a protective structure with 75% windbreak fabric on the south and west walls, 50% windbreak fabric on the north and east walls and 16-quad cross netting on the roof. The same three varieties of navel oranges were also planted outside the protective structure for comparison. All trees were grafted on Troyer Citrange rootstock. Trees were planted on the 30th April 2006 on raised beds with 3 metre spacing between trees and 6 metre spacing between rows. All treatments received the same irrigation, fertiliser, pest management and physiological management.

The circumference of the rootstock and the scion was measured at 6 monthly intervals as a measure of tree growth. Brix and sugar acid levels were measured prior to harvest to determine fruit maturity. Fruit was harvested at a minimum Brix of 8.0% and a minimum Sugar:Acid Ratio of 8.0:1. Once fruit had been harvested it was de-greened according to industry practice and then graded according to the industry standard (1, 2) as a measure of yield and pack-out.

RESULTS

For the first 12 months trees were established and growth forced with regular treatments of foliar fertiliser. Trees were pruned to maintain shape and to develop structure. Flowers were removed and trees not cropped.

During the second year (winter 2007) trees commenced flowering in late August. It was decided that trees inside the net structure were large enough to carry a light crop of fruit and trees were managed to this effect until harvest in April 2008.

During the first two years of growth the circumference of the rootstock and scion were measured as an indication of tree growth and vigour. There was no significant difference in the growth of the rootstock or scion circumference between the three varieties of navel oranges. Trees growing outside the protective structure had a significantly smaller rootstock circumference than trees growing inside the protective structure (Fig. 1).

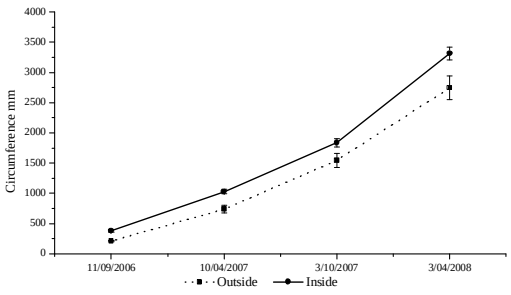

Figure 1. Mean circumference (mm) of rootstock measured 10cm above the soil for navel oranges grown inside and outside of a protective structure over four dates.

Trees growing outside the protective structure also had a significantly smaller scion circumference than trees growing inside the protective structure (Fig. 2).

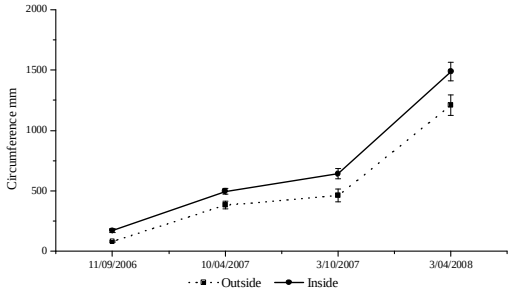

Figure 2. Mean circumference (mm) of scion measured 10cm above the graft union for navel oranges grown inside and outside of a protective structure over four dates.

Fruit was harvested from all the trees on 1 April 2007 when Brix and Sugar:Acid ratios were 10.6% and 18:1 for Navelina from inside the protective structure, 10.2% and 11:1 for CaraCara from inside the protective structure and 10.0% and 15:1 for Newhall from inside the protective structure.

The number of marketable fruit (regardless of class) and the weight harvested from each tree was recorded in the field. There was no significant difference in the number of fruit per tree (F=2.036, P=0.140) or the weight harvested per tree (F=1.659, P=0.200) between the varieties. There was a significant difference between the number of fruit per tree (F=10.513, P=0.002) and the weight of fruit harvested (F=11.606, P=0.001) between the treatments. Trees inside the protective structure had a higher yield than trees outside the protective structure (Table 1).

Table 1. Number of marketable fruit (regardless of class) and weight (kg) of fruit harvested from navel oranges grown inside and outside of a protective structure.

Variety		Inside	Outside
Navelina	Marketable Fruit	9.3±2.5	3.0±1.5
	Yield (Kg/Tree)	3.0±0.8	1.0±0.5
Newhall	Marketable Fruit	22.1±3.6	4.4±2.2
	Yield (Kg/Tree)	6.4±0.9	1.3±0.6
CaraCara	Marketable Fruit	16.7±2.9	9.2±3.9
	Yield (Kg/Tree)	4.5±0.7	2.5±1.1

Due to time constraints only the Navelina oranges had been graded at the time of publication. There was a significant difference in the grades of fruit between inside and outside of the protective structure (F=7.941, P=0.006). Trees inside the protective structure had significantly higher number of Class 1 fruit.

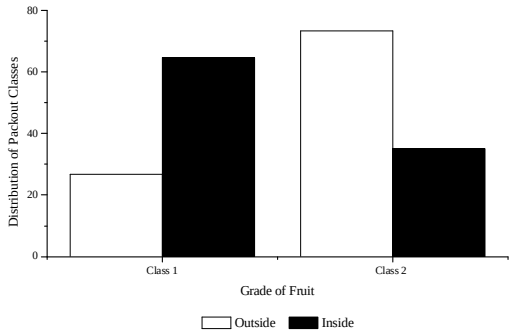

Figure 3. Percentage of total fruit across each Class Grade for Navelina Oranges harvested from trees grown inside of and outside of a protective structure.

DISCUSSION

Protective structures can be utilised to enhance the growth and improve cropping of early season easy peel navel oranges in Carnarvon. Currently in Carnarvon, citrus trees grown outside a protective structure will realise the first crop around year 4 with full production achieved by year 8. Under a protective structure we have been able to halve the time to first crop to 2 years without unduly stressing the trees. We forecast that these trees should reach full production by year 4-6.

Easy peel navel oranges grown under a protective structure had fewer blemishes but the protective structure did not completely solve the problem with rind blemishes. Most blemishes in the Carnarvon citrus industry are caused by wind rub where fruit rub against each or against twigs and leaves in the wind. Even under the protective structure, first grade fruit showed minor blemishes caused by wind rub. In order to overcome this, the authors believe we now need to examine tree management and pruning practices to minimise wind rub and lift fruit from 1st grade to the extra grade category.

Before this trial commenced a Benefit Cost Analysis was performed on the likelihood of success. The BCA was performed on a best case scenario assuming full production by the 4th year, a pack-out ratio of 90%, and production of 90 tonnes per hectare. While it is still very early days, the project is well on the way toward achieving this result.

ACKNOWLEDGMENTS

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