

# Preliminary studies of flower and fruit development in Tasmania, Australia

*M.D. Lang<sup>1</sup>, J.A. Sulcs<sup>2</sup> and K.J. Evans<sup>1</sup>*

<sup>1</sup>TIAR, University of Tasmania (UTAS), P.O. Box 3523, Burnie, TAS, Australia, 7320.

<sup>2</sup>Webster Walnuts, PO Box 1283, Devonport, TAS, Australia, 7310.

Email: Michael.Lang@utas.edu.au

## Introduction

- Main cultivar trees within walnut orchards in Tasmania, Australia, are predominantly lateral-bearing cultivars; however, the flowering phenology of these cultivars in Tasmania has not been documented.

- In Californian orchards, asynchrony in flowering can prevent pollination of late-developing female flowers, and distances greater than 15-30 m from polleniser trees, can reduce fruit set (1,2).

- The aims of this study were to describe the phenological development of male and female flowers, and to examine the effect of pollen dynamics on fruit set, in Tasmania.

## Methods

- Trials were conducted in 2006-07 and 2007-08 in two commercial orchards in Tasmania.

- **Temporal flower and fruit development:** Single Chandler, Lara and Vina trees were randomly selected 7, 21, 35 and 56 m downwind from polleniser trees.

- Pollen shedding and flower receptivity were recorded in polleniser and main cultivar trees on one branch per tree at weekly intervals from bud-burst until the completion of pistillate flower receptivity.

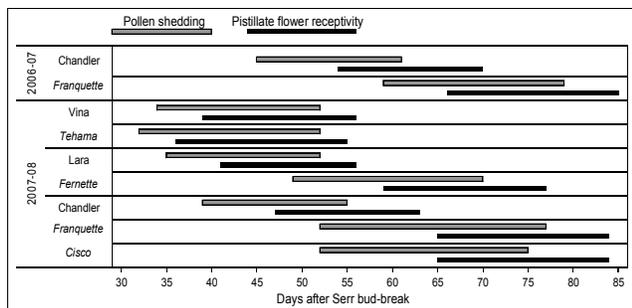
- Fruit presence or absence was assessed in main cultivars on 20 individually tagged flower clusters per tree at one month intervals from flower receptivity until harvest.

- Crop yield was assessed by shaking trees prior to harvest and recording the number of marketable nuts.

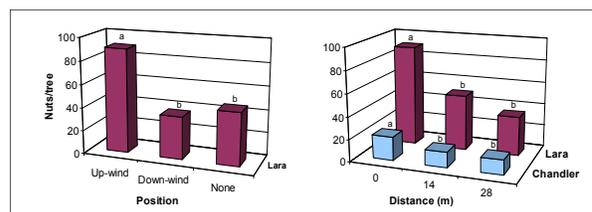
- **Supplemented pollen:** Pollen shedding catkins, excised from Franquette trees distant to trial sites, were placed in polyester meshed bags, or catkin bags, and transported to trials sites in cooled containers.

- Catkin bags, with 4-5 catkins each, were placed either on the up-wind or down-wind side of Chandler and Lara tree canopies for the duration of flower receptivity.

- Trees with catkin bags, trees immediately next to catkin bags, and trees 14 m and 28 m down-wind of catkin bags, were assessed for crop yield as described above.



**Figure 1.** Duration of pollen shedding and pistillate flower receptivity for main (normal text) and polleniser (italicized text) cultivars and year specified.



**Figure 2.** Mean number of nuts from trees with catkin bags (left), and from trees 14 m and 28 m downwind of catkin bags (right). The bars coloured blue and maroon represent Chandler and Lara respectively.

**Table 1.** Fruit set and crop yield in Chandler, with Franquette pollenisers, in 2006–07

Distance from polleniser (m)	Fruit set (%) <sup>A</sup>				Yield (nuts/tree) <sup>A</sup>
	0 PFR <sup>B</sup>	14 PFR <sup>B</sup>	41 PFR <sup>B</sup>	112 PFR <sup>B</sup>	
7	100.0 a	57.1 a	38.9 a	33.5 a	367.2 a
21	100.0 a	46.3 a	23.9 a	19.7 a	268.7 ab
35	100.0 a	41.8 a	24.6 a	21.0 a	124.7 b

<sup>A</sup> Within each column, figures accompanied by the same letter form a group of means within which there are no statistically significant differences at  $P = 0.05$ . <sup>B</sup> PFR = days after pistillate flower receptivity.

## Findings

- Female flowers in Lara and Chandler were receptive throughout the duration of pollen shedding from either self-pollen or polleniser trees (Fig 1); however, late developing female flowers in Vina were receptive after pollen shedding from Tehama pollenisers.

- In 2006-07, the greatest proportion of fruit drop in Chandler occurred within 6 weeks of flower receptivity (Table 1); however, severe spring frosts may have promoted drop.

- Crop yield increased significantly with up-wind placement of catkin bags in comparison to down-wind placement, and in trees 14 m or further, away from the pollen source (Fig. 2). Yield was significantly reduced when Chandler trees were 21 m (data not presented) and 35 m (Table 1) away from polleniser trees.

- There was no significant difference in fruit set and crop yield between trees 7 m and 28 m from polleniser trees in 2007-08 (data not presented).

## Summary

- Documentation of flowering phenology identified the separation of flower bloom between main and polleniser cultivars. Results confirmed that Chandler and Lara can achieve synchrony for pollination, whereas late developing Vina flowers might escape pollination by Tehama.

- Supplemented pollen increased crop yield; however, effects were limited spatially, required up-wind placement within the tree canopy, and may be cultivar dependent.

- Research on causes of flower and fruit drop is ongoing.

## Acknowledgments

This project was supported by the Australian Government through Horticulture Australia Limited in partnership with Webster Walnuts, and was managed by Agronico Pty Ltd., 175 Allport St. East, Leith, TAS, 7315 [www.agronico.com.au](http://www.agronico.com.au)

## References

1. Polito, V.S. (1998). Floral biology: flower structure, development, and pollination. *Walnut production manual* (Editor: D.E. Ramos), University of California, Oakland, USA, pp. 127–132.
2. Polito, V.S., Aradhyia, M., Dangl, J., Grant, J., Pinney, K., Vaknin, Y. and Weinbaum, S. (2003). Walnut pollination dynamics: pollen flow and pollen loads in walnut orchards ([http://walnutresearch.ucdavis.edu/2003/2003\\_185.pdf](http://walnutresearch.ucdavis.edu/2003/2003_185.pdf))