

Chemical and cultural management of pistillate flower abortion in Tasmania, Australia

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Introduction

Pistillate flower abortion (PFA) is responsible for the loss of female flowers shortly after bloom and is caused by excess ethylene production in flowers following fertilisation. PFA has been reported worldwide (1,2,3,4) and has led to crop losses in cultivar Serr in Tasmania, Australia. PFA is correlated positively with pollen load (1); however, threshold levels that induce PFA differ between cultivars. Objectives of this study were to determine the efficacy of the commercially available ethylene inhibitor, ReTain[®], and the effect of reducing pollen load, on PFA in Tasmania.

Materials and Methods

Trials and treatments

- Trials were conducted over three growing years in two commercial orchards of cultivar Serr in Tasmania
- In 2004-05, single-tree plots ($n = 5$) and non-replicated 20-tree plots were treated with 850 g/ha or 1700 g/ha ReTain[®] at either the onset of pistillate flower (PF) receptivity in 20-tree plots, or 1 week after onset in single-tree plots.
- ReTain[®] was applied at a spray volume of 1000 L/ha with backpack- and orchard-misters in single-tree and multiple-tree plots, respectively.
- In 2005-06, single-tree plots ($n = 10$) were treated with ReTain[®] at 830 g/ha at 20-25% or 40-45% PF receptivity.
- In 2007-08, 120-tree plots ($n = 3$) were treated with ReTain[®] (830 g/ha) at 25-40% PF receptivity and/or catkins were physically removed (Fig. 1).

Assessment of fruit set

Fruit set was calculated as the percentage of immature fruits present at 3 and 7 weeks after PF receptivity for 10 shoots per tree with 2 or 3 pistillate flowers per shoot, tagged at PF receptivity. In multiple-tree plots, ten trees per plot were selected randomly for this assessment. Crop yield was calculated at harvest from the total number of marketable nuts per tree.

Findings

- In 2004-05, applications of ReTain[®] 1 week after the onset of PF receptivity were not effective; however, applications at the onset of receptivity increased fruit set by 30% in comparison to non-treatment (data not presented).
- In 2005-06, fruit set ranged from 60-64% in trees treated with ReTain[®] in comparison to 34-48% in non-treated trees (Fig. 2); however, crop yield was not significantly different between treatments (data not presented).
- In 2007-08, fruit set in non-treated trees was 52% whereas separate and combined treatments of ReTain[®] and catkin removal resulted in fruit set of at least 90% (Fig. 3). Furthermore, each treatment increased crop yield by at least 2.4-fold in comparison to non-treatment.



Figure 1. Serr catkins were physically removed at 10-20% PF receptivity with a one-second "shake" using a commercial tree shaker at an intensity of 1600 rpm

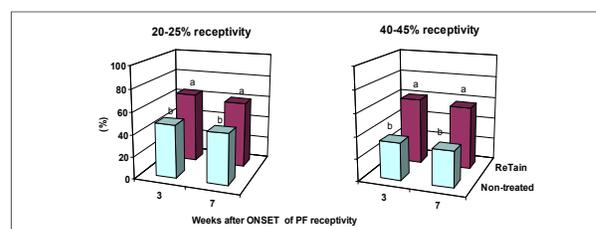


Figure 2. Fruit set (%) in 2005-06 at 3 and 7 weeks after PF receptivity in response to application of Retain[®] at 20-25% or 40-45% receptivity.

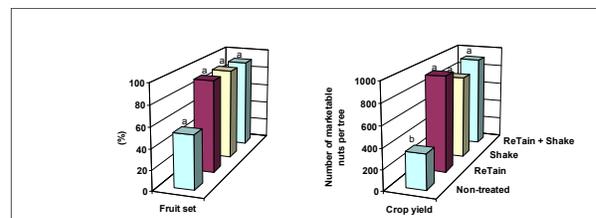


Figure 3. Fruit set (%) in 2007-08, 3 weeks after PF receptivity (left) and crop yield at harvest (right) after treatment with Retain[®] and/or catkin removal (Shake) treatment.

Summary

Chemical and cultural control of PFA in this study was inconsistent; treatment responses may have varied because of the different predisposition of each orchard to PFA, inadequate spray coverage and/or timing of treatment applications. However, the significant increase in fruit set in 2005-06 and 2007-08, plus crop yield in 2007-08, suggest potential strategies for managing PFA in Tasmania. Research to address PFA in cultivar Serr, and the predisposition of other cultivars to PFA in Tasmania, 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 ReTain[®] is manufactured by Valent BioSciences™, a division of Sumitomo Chemical Australia Pty Ltd, NSW, Australia.

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