

# LEAF BRONZING IN NASHI AND EUROPEAN PEAR IN RELATION TO POPULATIONS OF *TETRANYCHUS URTICAE* KOCH (ACARINA: TETRANYCHIDAE)

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## Summary

The link between *Tetranychus urticae* infestation and leaf bronzing in European pears is already known but no information exists for nashi (Asian pear). Twenty-two cultivars of both nashi and European pears in an experimental orchard at Orange NSW were rated for overall foliage bronzing. Six varieties of each type were selected, leaf samples taken and the number of active stages of *T. urticae* determined. Each leaf in the sample was rated for bronzing or scorch. A mite tolerance score was calculated for each variety based on the leaf samples. European pear as a group was less tolerant of mite infestation than nashi. The order of tolerance (most to least) for European pear was: Williams' Bon Chrétien, Beurré Bosc, Packham's Triumph, Doyenne du Comice, Mock's Red Williams' and Corella. For nashi it was: Shinsui, Kosui, Nijisseiki, Tsu Li, Ya Li and Hosui.

## INTRODUCTION

A relationship between mite infestation and leaf bronzing has been demonstrated in European pear by several authors. Turpin *et al.* (1962) reported browning on Williams' Bon Chrétien due to damage by *Tetranychus urticae* Koch (two-spotted mite). Similar damage was recorded in South Australia by Cant (1960) where infestation levels of about three mites per leaf caused scorch on unnamed cultivars. McNab and Jerie (1993) and Westigard *et al.* (1966) reported that browning and defoliation in one season could affect the fruit set, size and quality in the following season. The consensus from these reports was that scorching appears following infestation with a relatively small number of mites, usually corresponding with a period of hot, dry weather. McNab and Jerie (1991) showed a marked difference in the sensitivity to mites of Williams' Bon Chrétien and its red sport 'Sensation' (Mock's Red Williams'). The former reacted with severe scorching and the latter with virtually no scorching even though there were similar mite numbers on both. Dustan and Stevenson (1961) in Oregon, USA found that *Panonychus ulmi* (Koch) (European red mite) also caused pear leaf scorch. Less than three mites per leaf was sufficient to cause leaf scorch on Williams' Bon Chrétien, Beurré Bosc and Beurré d'Anjou but Kieffer was more resistant. This scorching was prevented by controlling the mites.

No Australian data on leaf bronzing due to mite infestation have been reported for nashi (Asian pear). In 1991 when the earliest varieties of nashi in a pear arboretum at Orange were being picked after a period of hot weather, some leaf scorching was observed on certain varieties. Shinsui and Kosui had quite a lot of scorching but there was very little on Nijisseiki. An infestation of two-spotted mite was present but no

correlations between mite populations and damage were attempted at the time. In February 1993, similar scorching occurred again after a period of hot weather and this paper reports the relative sensitivity of European pear and nashi varieties to two-spotted mite infestation.

## MATERIALS AND METHODS

Observations were carried out in a pear arboretum block at the Orange Agricultural Institute. It contains at least two adjoining trees (range 2–6) of each of 22 cultivars of both European pears and nashi, in no particular order, planted in six orchard rows. When foliage damage was observed in 1993, every tree was rated for overall bronzing on a six-point scale from 0 (no bronzing) to 5 (severe bronzing). Six varieties each of European pear and nashi were then selected for detailed examination, ranging from severely scorched varieties to ones showing very little damage. There were five single tree replicates of each variety. Fifteen mature leaves were randomly selected from each tree, approximately half from each of the inner and outer portions of the canopy. All active stages of *T. urticae* were counted on each leaf which was then rated for bronzing or scorch on a continuous scale of 0 (nil) to 5 (severe).

Data were analysed using a Genstat program. Study of the variances of two-spotted mite data indicated a log transformation ( $\log(tsm + 1)$ ) was necessary to stabilise variance. A mite tolerance score, defined as:

$$\log(tsm + 1) / \text{scorch rating}$$

was calculated for each variety of European pear and nashi (H.I. Nicol, pers. com.). Analysis of variance within each group was used to compare varieties for mites/leaf, scorch rating and tolerance score.

**Table 1.** Cultivars rated as whole trees for bronzing (scale 0 = nil to 5 = severe).

Whole tree rating	European pear	Nashi
<2	Dr Jules Guyot, General le Clerc, Hood, Mock's Red Williams', Passe Crassane, San Giovanni, Winter Nelis	Chouju, Dan Bae, Hosui, Hwa Hong, Kikusui, Niitaka, Nijisseiki, Okusankichi, Shin Go, Shinko, Shinsei, Shinseiki, Shinsetsu, Tsu Li, Ya Li
2	Beurré Hardy, Clapp's Favourite, Conference, Corella, Flordahome, Josephine de Malines, Packham's Triumph, Red Face	Bong Ri, Yakumo
2.5		Haeng Soo
2.8	Beurré Bosc	Kosui, Shin Soo
3	Doyenne du Comice, Winter Cole	Hakko
3.8	Williams' Bon Chrétien	
4	Harrow Delight, Lemon Bergamot, Precoce di Fiorani	Shinsui

**Table 2.** *T. urticae* infestation and foliage damage for six pear and six nashi cultivars. Leaf data based on 15 leaves x 5 replicates of each cultivar. Means followed by the same letter are not significantly different ( $P = 0.05$ ).

Cultivar	Scorch rating		Mean <sup>1</sup> mites/leaf	Mite tolerance score
	Whole tree	Individual leaf		
<i>European Pears</i>				
Mock's Red Williams'	1.0	1.00 b	7.78 a <sup>2</sup>	2.56 a
Corella	2.0	0.88 b	6.16 a	2.65 a
Packham's Triumph	2.0	1.12 b	0.64 b	1.25 bc
Beurré Bosc	2.8	2.33 a	4.03 a	0.79 bc
Doyenne du Comice	3.0	0.98 b	3.67 ab	2.05 ab
Williams' Bon Chrétien	3.8	2.19 a	0.57 b	0.31 c
<i>Nashi</i>				
Hosui	1.0	1.19 b	29.11 ab	5.23 a
Nijisseiki	1.0	1.48 b	29.75 ab	3.60 abc
Tsu Li	1.0	1.07 b	13.01 b	4.60 ab
Ya Li	1.2	1.32 b	43.79 a	5.17 a
Kosui	2.8	2.14 a	57.62 a	2.99 bc
Shinsui	4.0	2.58 a	60.19 a	2.02 c

<sup>1</sup>Retransformed<sup>2</sup>Significant differences apply to the log means

## RESULTS

In the field bronzing survey, some varieties of each tree type showed virtually no browning while others were severely bronzed. Still others were intermediate (table 1). From these observations, the six varieties of each type were selected so as to cover the damage range for the more detailed study. Whole tree ratings for these varieties and individual leaf scorch ratings are given in table 2. Retransformed means for mite numbers and tolerance scores are also shown in table 2. The mite numbers on European pears were much lower than on nashi. Mock's Red Williams' had 15 times as many mites per leaf and little damage compared with Williams' Bon Chrétien. For nashi, the mite infestation range was narrower, 4-fold between Tsu Li (lowest) and Shinsui.

## DISCUSSION

The whole tree ratings (table 1) showed definite cultivar differences in spite of being such a subjective method. Most pears were damaged to varying degrees. Mock's Red Williams' did not show the susceptibility to mites that its parent variety (Williams' Bon Chrétien) did (table 2), a finding consistent with McNab and Jerie (1991). Our whole tree scorch data also had these two cultivars at opposite ends of the scale and the mite tolerance score was consistent with that observation. For nashi, the closely grouped Hosui, Nijisseiki, Tsu Li and Ya Li on the whole tree scorch rating had mite tolerance scores which were not significantly different (table 2). Shinsui stood out as being the most sensitive nashi cultivar (highest tree and leaf scorch,

lowest mite tolerance score). While Shinsui had the highest mite population, this was not significantly different from Hosui which has the highest mite tolerance score.

Based on the mite tolerance scores, the most sensitive nashi varieties (Kosui and Shinsui) were equivalent to the most tolerant European pears (Mock's Red Williams' and Corella).

The practical implications of these findings are that hot summer conditions and a build-up in two-spotted mite numbers can predispose several varieties of nashi to leaf bronzing, say those with a whole tree scorch rating of 2, or greater, in table 1. Our results also suggest that nashi varieties are generally more tolerant of mites than European pears.

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