

# Initial results of fertilizer trials aimed at reducing orchard cold/freeze damage and grey speckle in South African avocado

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## ABSTRACT

This paper reports on follow up research trials aimed at reducing the orchard cold/freeze damage and grey speckle disorders of South African avocados. In terms of orchard cold/freeze damage, an experimental trial was launched aiming to reduce the disorder in 'Hass' through increased nitrogen fertilizing. In a similar fashion, a trial was laid out to increase the calcium content of grey speckle susceptible 'Fuerte' fruit by means of additional calcium nitrate applications. The 2008 avocado season was relatively warm. The incidence of grey speckle was low and this confirmed our hypothesis that this disorder is caused by low orchard temperatures. Due to the warm orchard temperatures, no cold/freeze damage occurred in an experimental 'Hass' orchard either. However, we were able to make some observations in a second 'Hass' orchard with a low incidence of cold/freeze damage. This allowed us to make preliminary fruit pulp nitrogen recommendations for cold orchards.

## INTRODUCTION

During the 2007 avocado season, unusually low orchard temperatures caused significant losses to all cultivars due to orchard cold/freeze damage. The incidence of grey speckle also dramatically increased in the 'Fuerte' cultivar. Preliminary investigations into the causes of these physiological disorders indicated that 'Hass' orchards with a low nitrogen status are most susceptible to orchard cold/freeze damage (Kruger *et al.*, 2008). In terms of grey speckle, Kruger *et al.* (2008) found that the calcium content of affected 'Fuerte' fruit was lower than that of healthy fruit. During the 2008 season, experimental trials were launched aiming to increase the nitrogen content and ultimately the canopy density of 'Hass' trees through increased nitrogen fertilizing. In a similar fashion, a trial on the grey speckle disorder was laid out to increase the calcium content of 'Fuerte' fruit by means of additional calcium nitrate. The 'Fuerte' trial further aimed to confirm whether grey speckle is caused by low orchard temperatures.

## MATERIALS AND METHODS

The orchard freeze damage trial was laid out in 'Hass' block 5 at Pine Valley Estates. Extra nitrogen in the form of calcium nitrate, at a rate of 150 g/tree, was applied to treatment trees, in addition to the 200 g N already being applied in the form of ammonium sulphate. Each treatment was replicated 4 times with each replicate consisting of 5 trees, of which the 3 middle trees served as data trees.

With regards to grey speckle, a trial was laid out in

'Fuerte' block 10 at Pine Valley Estates in the Schagen area. The trial consisted of three treatments, namely, additional Ca (top dressed), additional Ca (applied in trenches) as well as an untreated control. Each treatment was replicated 4 times with each replicate consisting of 5 trees each, of which the 3 middle trees served as data trees.

In both the grey speckle and orchard freeze damage trials, it was not possible to take fruit samples on a monthly basis due to a very low crop. However, leaf mineral content status was monitored on a monthly basis.

## RESULTS AND DISCUSSION

The leaf nitrogen content of trees that received additional nitrogen was significantly higher than that of the control as from the end of January until the beginning of May, after which the two treatments were similar (**Figure 1**). However, due to winter temperatures at the experimental site not being cold enough during the 2008 season, no cold/freeze damage symptoms developed.

Unfortunately, the inability to generate results due to unfavorable climatic conditions occurs with this type of project. In an attempt to increase our understanding of the interaction between orchard cold/freeze damage and nitrogen, we would like to refer to the chilling injury trial conducted by Magwaza *et al.* (2009) with 'Hass' at Kiepersol. In this trial it was noticed that, for a reason we do not understand as yet, the application of iron in the form of DDPA (Fe chelate) decreased the



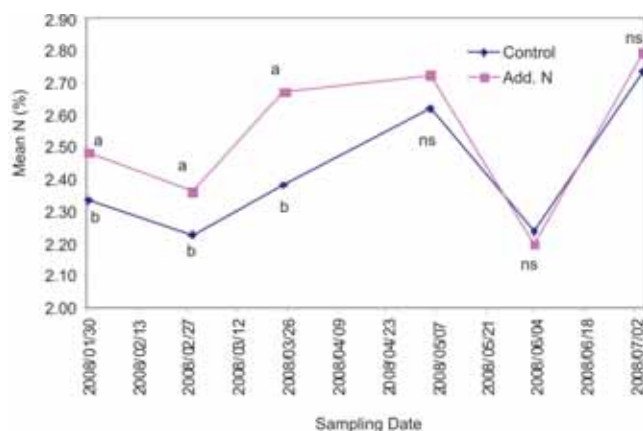
nitrogen status of the trees. In this orchard, it was observed that one replicate developed significantly more orchard cold/freeze damage symptoms than the other 9 replicates (**Figure 2**). The symptoms became especially visually apparent towards the end of the season. The nitrogen content of this replicate appeared to be lower than that of the other nine replicates (**Figure 3**). In light of these observations we would like to propose the following preliminary fruit nitrogen content recommendations for orchards prone to cold/freeze damage during winter: Fruit N content should not be lower than 1% in December, not lower than 0.9% in February and should not be lower than 0.8% in March.

With regard to grey speckle, again, there was no development of the disorder. When comparing the minimum temperatures recorded during a high incidence

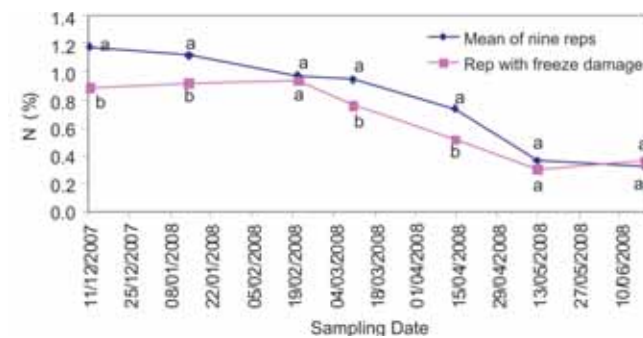
grey speckle season (2007) with that of the current season (**Figure 4**), it is clear that very low temperatures prevailed during May 2007 when most of the damage occurred. This serves to support our hypothesis that grey speckle is related to low orchard temperatures.

#### LITERATURE CITED

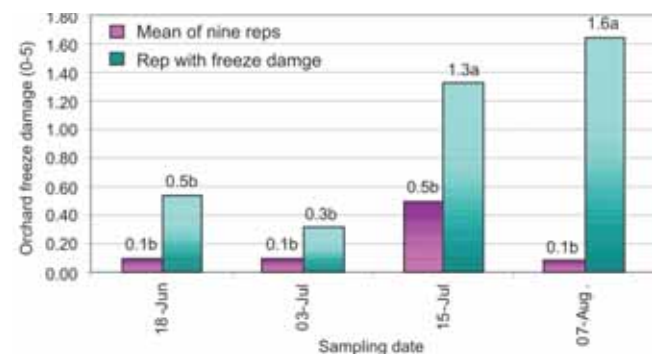
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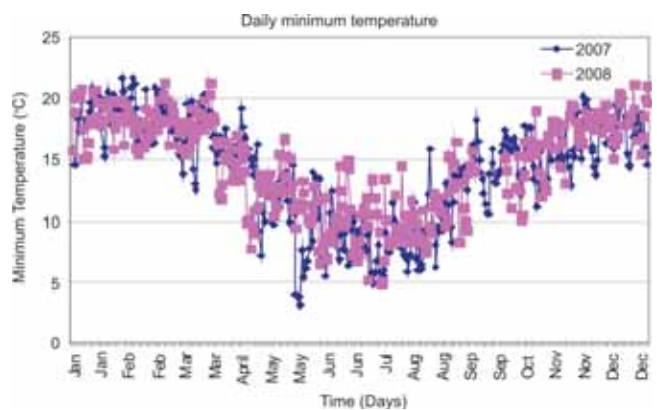
**Figure 1.** Seasonal changes in the leaf nitrogen content of 'Hass' trees (Block 5, Pine Valley) where additional nitrogen applications were made to reduce orchard cold/freeze damage



**Figure 3.** Mean flesh nitrogen content of 'Hass' avocado fruit sampled at different dates during 2007/08 season (Chilling injury trial, Magwaza *et al.*, 2009)



**Figure 2.** The effect of fruit nitrogen content on the severity of orchard freeze damage disorder on 'Hass' fruit harvested on different dates. (Chilling injury trial, Magwaza *et al.*, 2009). The statistics are based on single fruit observations. Nine reps n = 90 fruit, one rep n = 10 fruit



**Figure 4.** Minimum temperatures prevailing at Pine Valley during 2007 and 2008

