Chemical control of pre- and postharvest diseases of avocados

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ABSTRACT
Cercospora spot of avocados was effectively controlled by preharvest applications of Captab or Benomyl. All the evaluated fungicides, except Benomyl, controlled stem-end rot and Dothiorella/Colletotrichum complex. EN600 (experimental additive) did not improve the effectiveness of Benomyl. All the fungicide treatments significantly controlled anthracnose. NuFilm did not significantly improve the effectiveness of copper oxychloride.

INTRODUCTION
Avocados are subjected to numerous fruit diseases (Darvas & Kotzé, 1987). Sooty blotch caused by Akropeltopsis sp (Theron, Kotzé & Wehner, 1981) and Cercospora spot caused by Pseudocercospora purpurea (Cke) Deighton (Darvas & Kotzé, 1987) are important preharvest diseases. The major post-harvest diseases are stem-end rot caused by any of ten pathogens, the most important being Thyronectria pseudotricha (Schw) Seeler (Darvas, 1978); Antracnose (Colletotrichum gloeosporioides Penz) and Dothiorella rot (Dothiorella aromatic). Colletotrichum gloeosporioides is usually associated with Dothiorella rot, to form the so-called Dothiorella/Colletotrichum complex (Darvas, 1978).

In all the above instances, infection of the fruit takes place before harvest. Preharvest application of fungicides is therefore fairly successful in controlling these diseases. There have been many reports published on preharvest chemical control of avocado fruit diseases in South Africa (Darvas, 1977; Darvas & Kotzé, 1978; Darvas & Kotzé, 1981; Kotzé, Kuschke & Durand, 1981; Darvas, 1981; Kotzé, Du Toit & Du Rand, 1982; Darvas, 1982; Labuschagne & Rowell, 1983; Darvas, 1983; Denner & Rowell, 1985, 1987; and Darvas & Kotzé, 1987). This paper reports on further preharvest chemical control trials carried out at Hall & Sons (Nelspruit) during the 1988/98 growing season.
MATERIALS AND METHODS

The field trial was conducted in a six-year-old Fuerte avocado orchard at H L Hall & Sons, Mataffin. A randomised block design was used, with five replicates of one tree plots per treatment. The following fungicide treatments were evaluated:

<table>
<thead>
<tr>
<th>Fungicide treatment</th>
<th>Rate (per 100l water)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>100 g ai</td>
</tr>
<tr>
<td>Virkon WP (850 g/kg ai)</td>
<td>255 g ai + 25 ml</td>
</tr>
<tr>
<td>Virkon WP + NuFim</td>
<td>25 g ai + 25 ml</td>
</tr>
<tr>
<td>Kocide WP (770 g/kg ai)</td>
<td>250 g ai + 25 ml</td>
</tr>
<tr>
<td>Benlate DF</td>
<td>25 g ai</td>
</tr>
<tr>
<td>Benlate DF + EN900</td>
<td>25 g ai + 25 ml</td>
</tr>
<tr>
<td>Captan WP</td>
<td>100 g ai</td>
</tr>
</tbody>
</table>

A high volume applicator with hand lanees was used to apply the fungicides. The spray treatments commenced on 14-11-88. Further applications took place on 22-12-88 and on 16-01-89. The fruit was picked on 30-03-89. All sampling was done at shoulder height and between 30 and 40 fruits were picked from each tree. The fruit was placed in standard carton containers and transported to the laboratory where it was rated immediately for preharvest diseases. The fruit was then allowed to ripen at ambient temperatures until it reached eating-ripe stage when it was evaluated for the occurrence of postharvest diseases.

The various diseases were assessed by rating individual fruit according to the following keys:

D/C complex:

*Dothiorella/Colletotrichum* complex was rated on a scale 0-10 where 0 represents clean fruit (no lesions) and 10 represents fruit completely covered with lesions.

Bulb-discolouration (physiological damage caused by moisture loss) was assessed according to the following key:
D/C complex:

*Dothiorella/Colletotrichum* complex was rated on a scale 0-10 where 0 represents clean fruit (no lesions) and 10 represents fruit completely covered with lesions.

Bulb-discolouration (physiological damage caused by moisture loss) was assessed according to the following key:

**RESULTS**
Fig 1 Effect of fungicide treatments on Cercospora spot expressed as percentage clean fruit (% 0 ratings) and percentage exportable fruit (% 0 ratings plus % 1 ratings). Bars not sharing a common letter are significantly different (P=0.05) according to Duncan's multiple range test.

Fig 2 Effect of fungicide treatments on stem-end rot expressed as percentage clean fruit (% 0 ratings) and percentage exportable fruit (% 0 ratings plus % 1 ratings). Bars not sharing a common letter are significantly different (P=0.05) according to Duncan's multiple range test.
Fig 3 Effect of fungicide treatments on D/C complex (Colletotrichum and Dottiorellia) expressed as percentage clean fruit (% 0 ratings) and percentage exportable fruit (% 0 ratings plus % 1 ratings). Bars not sharing a common letter are significantly different (P=0.05) according to Duncan's multiple range test.

Fig 4 Effect of fungicide treatments on anthracnose expressed as percentage clean fruit (% 0 ratings) and percentage exportable fruit (% 0 ratings plus % 1 ratings). Bars not sharing a common letter are significantly different (P=0.05) according to Duncan's multiple range test.
DISCUSSION

From the results it is clear that the Benomyl and Captab treatments controlled *Cercospora* spot significantly better than any of the other treatments. Although three Benomyl treatments were applied, two treatments per season are mostly sufficient (Darvas, 1978). The danger of resistance developing against Benomyl mitigates against more than one Benomyl spray per season and in some areas Benomyl has been replaced by fungicides that contain copper.

There was a relatively low incidence of stem-end rot (only 9,6 per cent diseased fruit in untreated control). A Benomyl programme did not control stem-end rot or D/C complex. The effectiveness of the Benomyl treatment was not significantly improved by using Benomyl with the additive EN600. The other fungicide treatments, viz, copper oxychloride, copper oxychloride plus NuFilm, copper hydroxide and Captab did, however, control stem-end rot and D/C complex significantly better than the control.

Significant control of anthracnose was achieved with all the fungicide treatments.

NuFilm did not significantly improve the effectiveness of copper oxychloride. The addition of additives such as NuFilm for controlling avocado diseases with preharvest coppersprays, is questionable.

The fungicide treatments had no significant effect on the physiological phenomenon called bulb-discolouration.
ACKNOWLEDGEMENTS

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REFERENCES