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Alternative control of Cercospora spot on Fuerte

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ABSTRACT

Alternative chemicals to Copper oxychloride were evaluated for the control of Cercospora spot on Fuerte during the 1999 to 2002 seasons, however, none of the products tested matched the efficacy of Copper oxychloride. An alternative approach was therefore explored in the 2002/03 season in order to reduce the amount of Copper applied to orchards. Lower application volumes of Copper oxychloride and alternative copper products were evaluated and the experiment was carried out at Westfalia Estate. A row of large Fuerte trees was used for each treatment and treatments were applied using an Ultima mistblower. Fruit of different treatments and different areas of the tree canopy were evaluated for incidence of Black spot, sooty blotch and visible spray residues in the orchard at the end of May 2003. Fruit samples from each treatment were cold stored and evaluated for post-harvest diseases and disorders upon ripening. Application with a mistblower reduced the amount of Copper applied to orchards dramatically as compared to standard hand gun application (up to 15 000 L/ha). The best control of Black spot was obtained with Copper oxychloride applied with the mistblower at 5 000 L/ha four times in the season. Copstar 120SC and Copper Count-N were also effective at lowered volumes. However, in all treatments fruit from the inner top section of the canopy had a higher incidence of black spot than those from other sections of the canopy. The incidence of post-harvest disease was low in all treatments.

INTRODUCTION

Avocado Black spot (Cercospora spot) remains the most serious pre-harvest disease of avocado in South Africa and the disease is usually controlled by two to five applications of copper fungicides during the rainy period (October to February) with benomyl often being included once per season. However, due to the changes in EU legislation regarding the use of benomyl, SAAGA recommends that growers use benomyl with care, allowing at least 90 days between application and harvest, in order not to exceed the current MRL of 0.01 mg/kg for benomyl (Boyum, 2003). The future use of carbendazim is also uncertain as it is on the pending list for substances to be withdrawn. Additionally high volume spraying with copper oxychloride could cause a build up of copper in our soils, which may render them unfit for future fruit production. Therefore finding alternative means to control Black spot is becoming more urgent.

Alternative chemicals to Copper oxychloride were evaluated in a high disease pressure orchard for the control of Cercospora spot on Fuerte during the 1999 to 2002 seasons, however, none of the products tested matched the efficacy of Copper oxychloride (Willis and Duvenahge, 2003; Duvenhage, 2002). Based upon these results an alternative approach was explored in the 2002-03 season in order to reduce the amount of Copper applied to orchards. Hence the focus was on low volume application techniques rather than trying to replace Copper oxychloride with an alternative product to be sprayed at high volume with hand guns.

The aim of this project was therefore to evaluate lower application volumes of Copper oxychloride and alternative copper products for control of Black spot *(Pseudocercospora purpurea)* and post-harvest diseases on Fuerte.

MATERIALS AND METHODS

Volumes tested in this trial were based upon results obtained from farm-based trials conducted by Westfalia Estate during the previous season. Copper count-N (Copper ammonium acetate, Hygrotech Seeds [Pty] Ltd); Copstar 120 SC (Copper hydroxide, Agchem Africa [Pty] Ltd); Cueve (Copper octanoate, Bio-grow chemicals [Pty] Ltd) and Polysun 320 (Lime sulphur, Unisun [Pty] Ltd) were compared with standard Demildex (Copper oxychloride, Delta Chemicals [Pty] Ltd) at different application volumes (Table 1). The experiment was carried out at Westfalia Estate near Duiwelskloof, Limpopo Province. The selected Fuerte orchard had a history of high

Table 1. Treatments and dates of application in the 2002/03 season

Treatment		17/10/02	15/11/02	12/12/02	10/01/03
1	Cu count-N 5 ml/L 10 000 L/ha	√	√	√	√
2	Copstar 120SC 3.5 ml/L 5 000 L/ha	√	√	√	√
3	Cueve 10 ml/L 5 000 L/ha	√	√	√	√
4	Polysun 320 7.5 ml/L 5 000 L/ha	√	√	√	√
5	Cu oxy 3 g/L 3 500 L/ha	√	√	√	√
6	Cu oxy 3 g/L 5 000 L/ha	√	√	√	√
7	Cu oxy 3 g/L + *Wenfenix 0.25% 3 500 L/ha	√ (W)	√ (W)	√	√
8	Cu oxy 3 g/L + *Wenfenix 0.25% 5 000 L/ha	√ (W)	√ (W)	√	√

*Wenfenix (W) was only included in the first two applications.

Table 2. Copper content of the products applied, amount of copper in each treatment and approximate product cost per hectare per year

Treatment		Copper content of product (%)	Copper applied kg/ha/yr	Product cost R/ha/yr
1	Cu count N 10 000 L/ha x 4	8	16	1010
2	Copstar 120SC 5 000 L/ha x 4	12	8.4	1295
3	Cueve 5 000 L/ha x 4	1.8	3.6	12 400
4	Polysun 320 5 000 L/ha x 4	0	0	-
5	Cu oxy 3 500 L/ha x 4	50	21	630
6	Cu oxy 5 000 L/ha x 4	50	30	900
7	Cu oxy + Wenfenix 3 500 L/ha x 4	50	21	840
8	Cu oxy + Wenfenix 5 000 L/ha x 4	50	30	1200
9	Cu oxy 14 000 L/ha x 3 (hand gun)	50	63	3780

disease pressure and trees were about 23 years old, planted at a spacing of 10 m x 10 m (100 trees/ha). About 17 trees (height ±8 m) pruned into hedge rows were used for each treatment. All treatments were applied using an Ultima mistblower. The Z values for the 2002/03 season were monitored by MTS and first spray was applied when Z = 4.5 and at least 50% of the fruit was pigeon egg size (Figure 2).

In each treatment, 50 fruit from each of the

different sections of the tree canopy (Figure 1) from 10 data trees were evaluated in the orchard, for the incidence of black spot, sooty blotch and visible spray residues at the end of May 2003. A 0 to 3 scale was used for evaluations as described previously by Duvenhage (2002). Fruit samples from each treatment were stored at 5.5°C for 28 days and evaluated for post-harvest diseases and disorders after ripening at 20°C. Statistical analysis of data was done using Tuckey's test at 95% significance level.

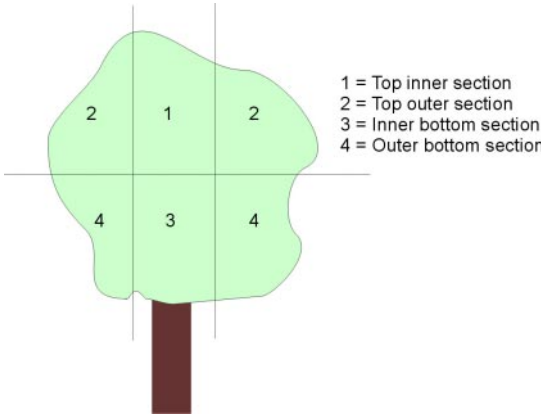

Figure 1. Diagram showing different sections of the tree canopy from which fruit was sampled and evaluated

RESULTS AND DISCUSSION

In this experiment, the decrease in application volumes did not reduce Black spot control, and the best control was obtained when Copper oxy-

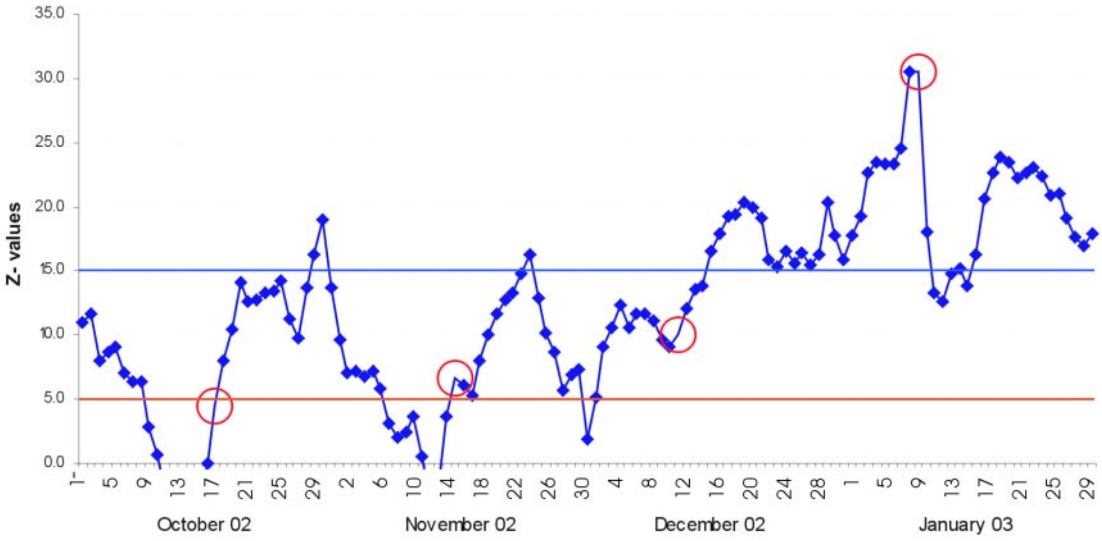

Figure 2. Z-values recorded at Merensky Technological Services for the 2002-2003 season, showing application dates of treatments (circles)

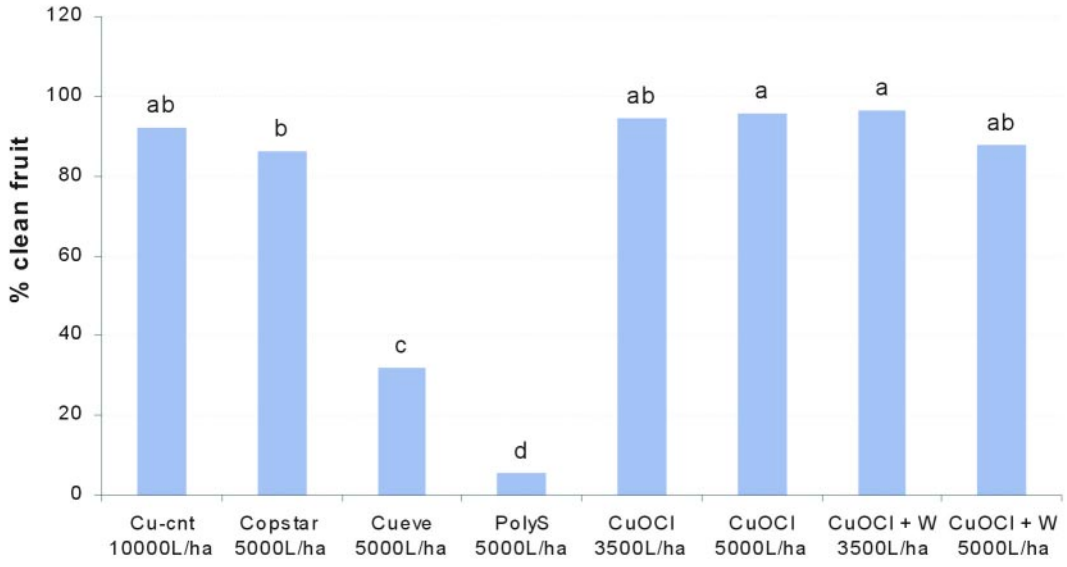

Figure 3. Percentage fruit free from Black spot in 2002-03

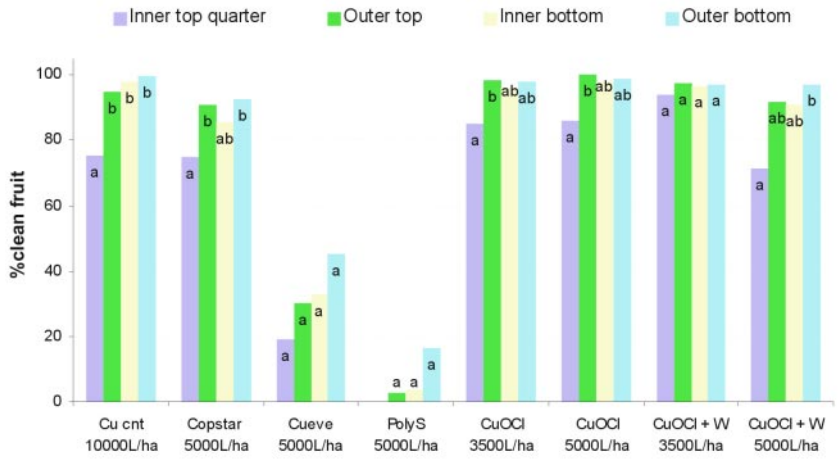

Figure 4. Percentage fruit free from Black spot in each section of the tree canopy in each treatment in 2002-03

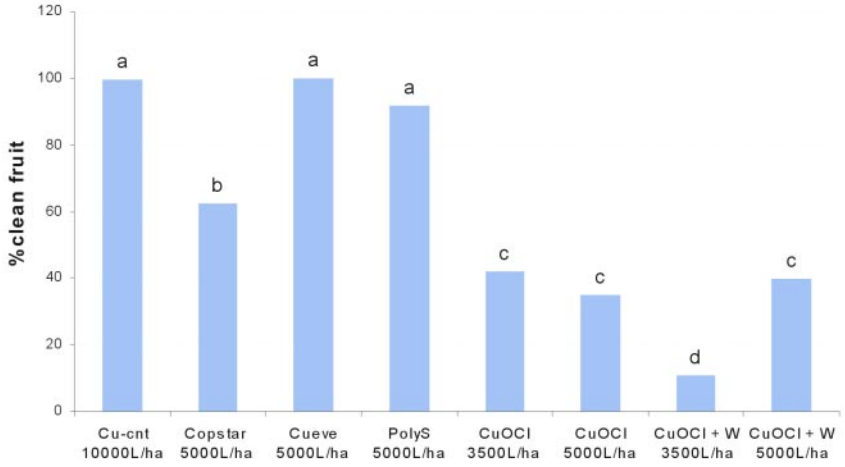

Figure 5. Percentage fruit free from visible spray residues in 2002-03

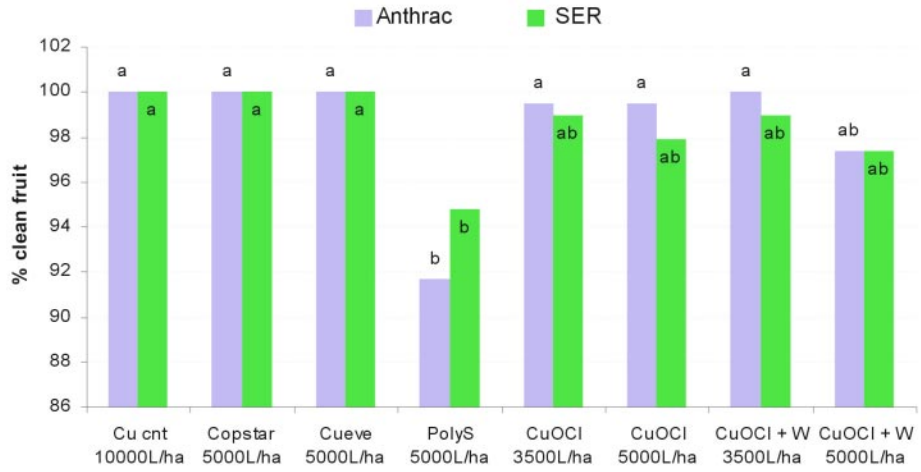

Figure 6. Percentage fruit free from Anthracnose and Stem-end rot in 2002-03

chloride was applied at 5 000 L/ha or at 3 500 L/ha if Wenfenix was included (Figure 3). It was expected that Copper oxychloride applied at 5 000 L/ha with Wenfenix, would have given better control than the results indicate, however, the trees in this treatment were only pruned on one side therefore spray penetration was negatively affected. Copper Count-N applied at 10 000 L/ha and Copper oxychloride applied at 3 500 L/ha did not differ significantly from the best treatments, nor from each other for control of Black spot. Copstar 120SC was slightly less effective, though not significantly less so than Copper Count-N. Cueve and Polysun 320 were ineffective in controlling Black spot and the low percentage clean fruit in these treatments indicates that disease pressure in the orchard was high.

Fruit were evaluated from different sections of the tree canopy in order to determine whether a poor result would be due to the application technique or chemical's efficacy. It is important to note that in all except three treatments (3, 4 and 7- Table 1), fruit from the inner top section of the canopy had a significantly lower percentage clean fruit from Black spot, than the other 3 sections of the tree (Figure 4). This indicates that spray penetration into the top inner section of the canopy is less when using a mistblower. This must be taken into consideration when planning a spray program.

Visible spray residues on the fruit were highest in treatments containing Copper oxychloride and the inclusion of Wenfenix further increased the residues. Fruit treated with Copper count-N had no visible spray residues (Figure 5).

On the whole, the occurrence of post-harvest diseases was very low. Fruit treated with Copper count-N, Copstar or Cueve were 100% clean from anthracnose and stem-end rot, and fruit treated with Copper oxychloride were slightly affected by these diseases (Figure 6). The incidence of physiological disorders was low and no significant differences between treatments were noted (results not shown).

Future trials will evaluate alternative chemicals and low copper containing products, employing the low volume application technique.

CONCLUSIONS

The amount of copper applied to orchards can be greatly reduced, as compared to hand gun application, by decreasing the application volume by using a mistblower (Table 2). Good Black spot control was achieved on large pruned Fuerte trees (100 trees/ha) when Copper oxychloride was applied at 5 000 L/ha or at 3 500 L/ha when Wenfernix was included. Fruit from the inner top section of the canopy had a higher incidence of Black spot. Visible spray residues were significantly higher when Wenfenix was included. Occurrence of post-harvest diseases was low in all treatments.

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