Alternative control of Cercospora spot on 'Fuerte' – progress report

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ABSTRACT

In 2004, alternative products and low copper content products were tested in order to reduce the amount of copper applied to orchards. Some products showed potential and therefore needed further evaluation. In the 2004/05 season, Ortiva™ and Bravo® were evaluated as alternatives to copper oxychloride (Demildex), and various products were evaluated as additives to reduced dosage rates of Demildex. Two alternative copper formulations were also evaluated. The experiment was carried out at Westfalia Estate, and 10 large 'Fuerte' trees pruned into hedge rows were used for each treatment. Two mistblowers were used in combination to apply volumes of 5500 ℓ/ha to 8200 ℓ/ha. Fruit were evaluated for incidence of black spot, sooty blotch and visible spray residues at the end of May 2005. Fruit samples from each treatment were cold-stored for 28 days, and evaluated for post-harvest diseases and disorders upon ripening. Although disease pressure in the orchard was high, all treatments resulted in good black spot control. The best control of black spot was obtained with two applications of Ortiva™ in October and November, followed by two applications of Demildex in December and January. Bravo® alternated with Demildex was just as effective. Both these spray programs resulted in a 50% reduction in the amount of copper applied per season, as compared to four applications of Demildex using mistblowers. Nordox and Copstar were not as effective as Demildex, although this difference was not statistically significant. The best control of post-harvest anthracnose was obtained with the Bravo / Demildex program followed by Copstar, whilst the best control of stem-end rot was with hand-gun application of Demildex.

INTRODUCTION

Alternative products to copper oxychloride have been evaluated at Westfalia Estate from 1999 to present and up until the 2003/04 season, the only feasible treatments that could replace copper oxychloride (Demildex) were alternative copper containing fungicides (Willis & Mabunda, 2004; Willis & Duvenhage, 2003; Duvenhage, 2002). However results from 2003/04 showed that Demildex alternated with Bravo (chlorothalonil) was as effective in controlling black spot as the standard application of Demildex with either handguns or a mistblower. The Demildex / Bravo® combination treatment also reduced the amount of copper applied per hectare annually by 50% when compared to the standard application with a mistblower (Willis, 2005).

The broad spectrum protectant fungicide Bravo has proven efficacy against Cercospora leaf spot on Groundnuts (Nel *et al.*, 2003) and therefore offers promise as an alternative product for black spot control. Lowered concentrations of Demildex (2 g/ℓ) applied together with Agromos™ also performed well and this combination treatment reduced the amount of copper applied per ha by 33%, however a 2 g/ℓ Demildex control treatment was not included and therefore a comparison could not be made (Willis, 2005).

The aim of this project was to further evaluate alternative fungicides and copper products for the control of black spot (*Pseudocercospora purpurea*) and post-harvest diseases on 'Fuerte'.

MATERIALS AND METHODS

The application volumes employed in this trial were based upon commercial application rates used at Westfalia Esate for large trees.

Bravo 720SC (Chlorothalonil, Syngenta [Pty] Ltd) alternated with Demildex (Copper oxychloride, Delta Chemicals [Pty] Ltd); Ortiva (Azoxystrobin, Syngenta [Pty] Ltd) in a program with Demildex; Nordox 750WP (Cuprous oxide, Avima [Pty] Ltd); Copstar 120SC (Copper hydroxide, Agchem Africa [Pty] Ltd); Sporekill (QAC, Hygrotech, [Pty] Ltd) and Agromos (Yeast cell wall extract, Improcrop cc) applied with a lowered rate of Demildex (2 g/ℓ) were compared with the standard Demildex rate applied with a mist-blower and with handgun applicators (**Table 1**).

The experiment was carried out at Westfalia Estate, Duiwelskloof, Limpopo Province. An orchard with high disease pressure was selected.

Trees were all in similar condition, about 25 years old and planted at a spacing of 10 m x 10 m (100 trees/ha). A row of about 10 trees (height ±10 m) was used for each treatment and treatments were applied using an Ultima mistblower and a Bateleur mistblower. Two buffer rows were allowed between each treated row in the block.

The trial was harvested at the end of May 2005 in order to allow for maximum disease development. In each treatment, 20 fruit from each quarter of the tree canopy from each of 10 data trees were evaluated (800 fruit / treatment). Fruit were evaluated in the orchard for the incidence of black spot, sooty blotch and visible spray residues. A rating scale of 0 to 3, as described previously by Duvenhage (2002), was used for the evaluations.

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 StatSoft, Inc. (2003). STATISTICA (data analysis software system), version 6.www.statsoft.com.

RESULTS AND DISCUSSION

Although disease pressure in the orchard was high in the test orchard, as indicated by the 95% black spot in the untreated control, all treatments resulted in good black spot control with no

statistically significant differences between treatments (**Figure 1**). This is in contrast with the 2003/04 season where large differences in product efficacy were found (Willis, 2005). Although no statistically significant differences were found between the various treatments in this experiment, the following observations can be made: Very good control of black spot was obtained with two applications of Ortiva in October and November, followed by two applications of Demildex in December and January.

Additionally, Bravo alternated with Demildex provided a similar good level of control. This result confirms the previous seasons findings, where the Bravo / Demildex treatment performed very well under high disease pressure (Willis, 2005). Importantly, both the Ortiva and Bravo spray programs resulted in a 50% reduction in the amount of copper applied annually as compared to four applications of Demildex using mistblowers (**Table 1**).

In this experiment Demildex at 2 g/ℓ provided a similar level of control of black spot as Demildex at 3 g/ℓ. This would help reduce the amount of copper applied annually by a third, and will be further investigated in the 2005/06 season in order to confirm this result. Nordox and Copstar were not as effective as Demildex, although this difference was not statistically significant (**Figure 1**). Conversely in the 2003/04 season, Copstar performed very poorly, resulting in only 10% clean fruit. This could have been due the high rainfall experienced in February and March 2004 and an extended infection period (Willis, 2005).

The Bravo® / Demildex treatment program resulted in the lowest amount of spray residues on the fruit, while application of Demidex with handguns resulted in 90% of fruit being affected by spray residues.

The amount of spray residues seen on the Sporekill™ / Demildex treatment was unexpected since a lower concentration of Demildex was used and Sporekill™ should not leave any spray deposits (**Figure 2**).

However, the difference noted were not statistically significant. Sooty blotch was well controlled by all treatments, except the untreated control (**Figure 3**). The best control of post-harvest anthracnose was obtained with the Bravo® / Demildex program, followed by Copstar.

The best control of stem-end rot was obtained with the handgun application of Demildex (**Figure 4**). Incidence of both post-harvest diseases was highest in the Sporekill™ / Demildex treatment, although this was not significantly different to the standard

Table 1. Treatments and amount of copper applied per ha per year in the 2004/05 season.

Tmt	October 04	November 04	December 05	January 06	Cu/ha/yr
1	Demildex 3g/L 8200L/ha	Ortiva 0.3ml/L 5500L/ha	Ortiva 0.3ml/L 5500L/ha	Demildex 3g/L 8200L/ha	24.6
2	Ortiva 0.3ml/L 5500L/ha	Ortiva 0.3ml/L 5500L/ha	Demildex 3g/L 8200L/ha	Demildex 3g/L 8200L/ha	24.6
3	Demildex 3g/L 8200L/ha	Bravo 3ml/L 5500L/ha	Demildex 3g/L 8200L/ha	Bravo 3ml/L 5500L/ha	24.6
4	Copstar 3.5ml/L 8200L/ha	Copstar 3.5ml/L 8200L/ha	Copstar 3.5ml/L 8200L/ha	Copstar 3.5ml/L 8200L/ha	13.7
5	Demildex 2g/L + 8200L/ha	Demildex 2g/L + 8200L/ha	Demildex 2g/L + 8200L/ha	Demildex 2g/L + 8200L/ha	32.7
6	Nordox 1g/L 8200L/ha	Nordox 1g/L 8200L/ha	Nordox 1g/L 8200L/ha	Nordox 1g/L 8200L/ha	24.6
7	Demildex 2g/L + Agromos 5ml/tree 8200L/ha	Demildex 2g/L + Agromos 5ml/tree 8200L/ha	Demildex 2g/L + Agromos 5ml/tree 8200L/ha	Demildex 2g/L + Agromos 5ml/tree 8200L/ha	32.7
8	Demildex 2g/L + Sporekill 1% 8200L/ha	Demildex 2g/L + Sporekill 1% 8200L/ha	Demildex 2g/L + Sporekill 1% 8200L/ha	Demildex 2g/L + Sporekill 1% 8200L/ha	32.7
9	Demildex 3g/L 8200L/ha	Demildex 3g/L 8200L/ha	Demildex 3g/L 8200L/ha	Demildex 3g/L 8200L/ha	49.2
10		Demildex 3g/L Handgun application		Demildex 3g/L Handgun application	±70
11	Control				

application of Demildex with mistblowers. The post-harvest results emphasize that anthracnose and stem-end rot are not necessarily controlled by the same types of fungicides.

CONCLUSIONS

Both Bravo® 720 and Ortiva™ appear to be feasible alternative fungicides that could replace two applications of copper oxychloride (Demildex) in a program. Further, more detailed work with these two products will continue in the forthcoming season.

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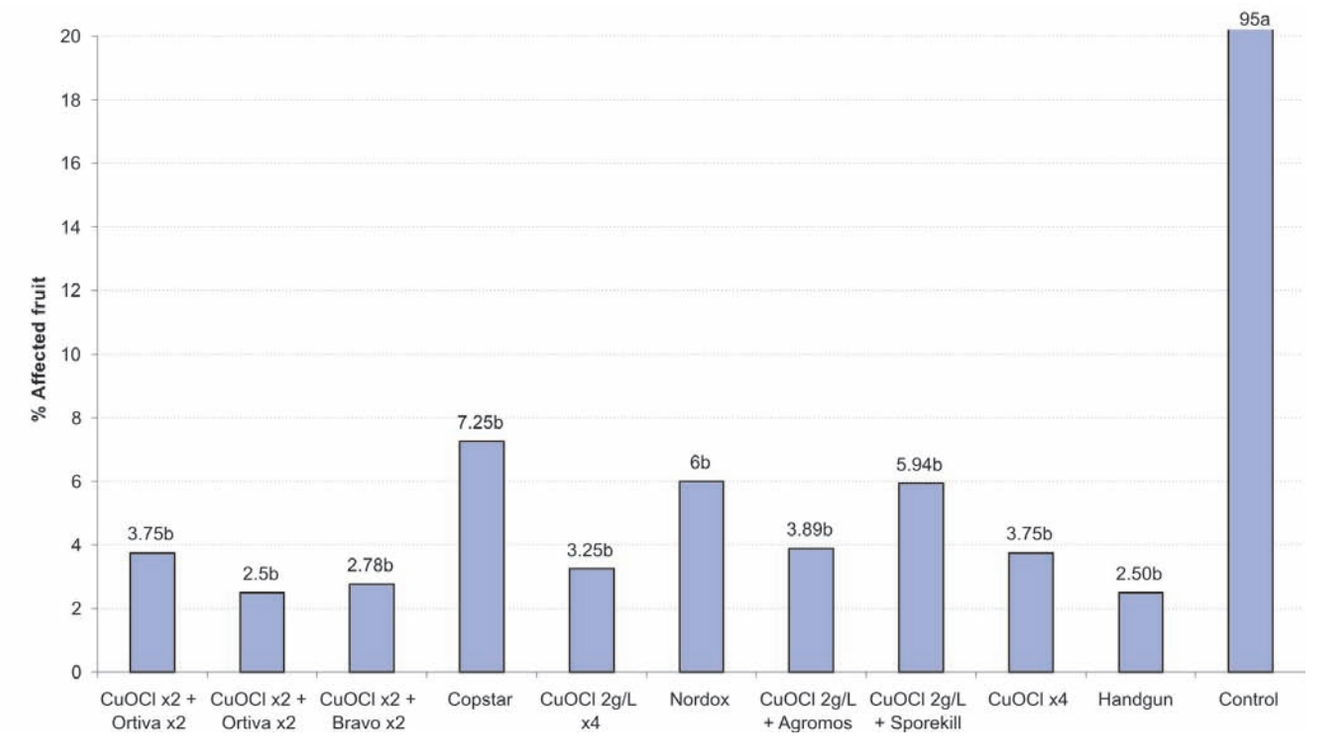

Figure 1. Percentage fruit affected by black spot in 2004/05.

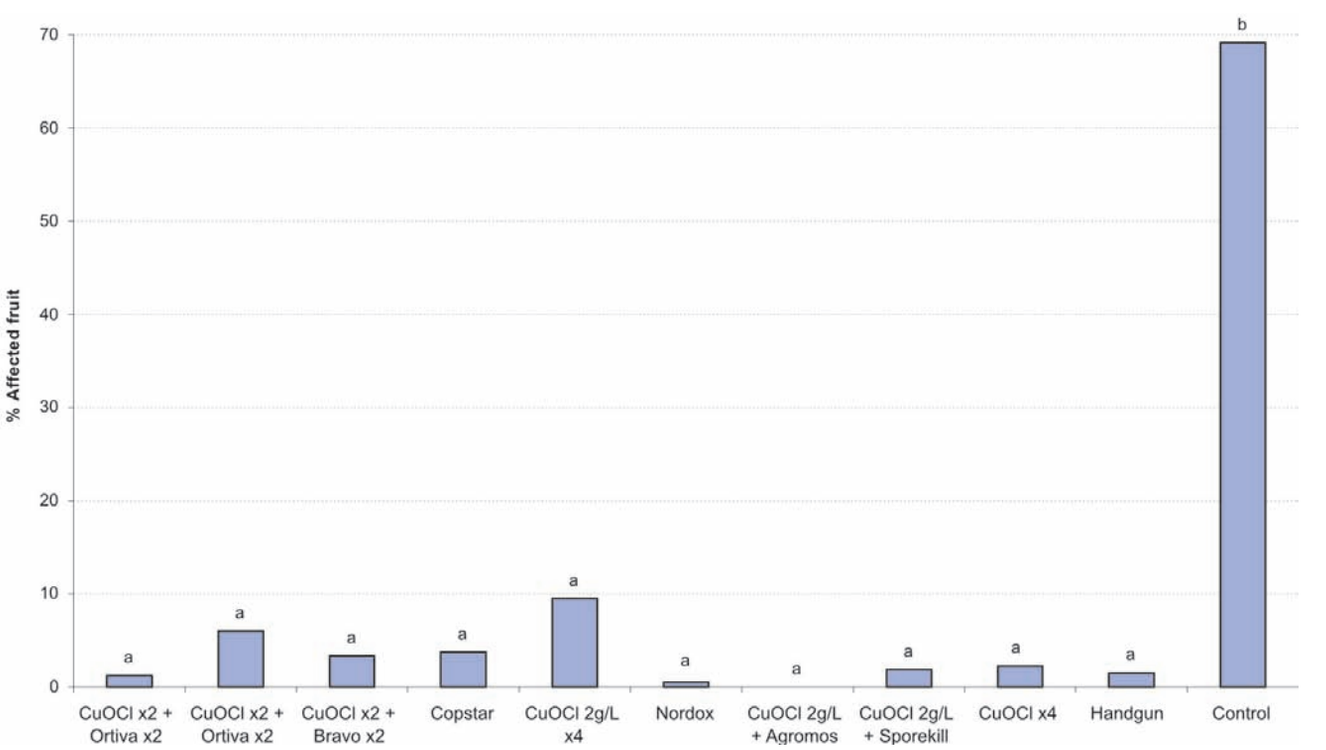

Figure 2. Percentage fruit affected by sooty blotch in 2004/05.

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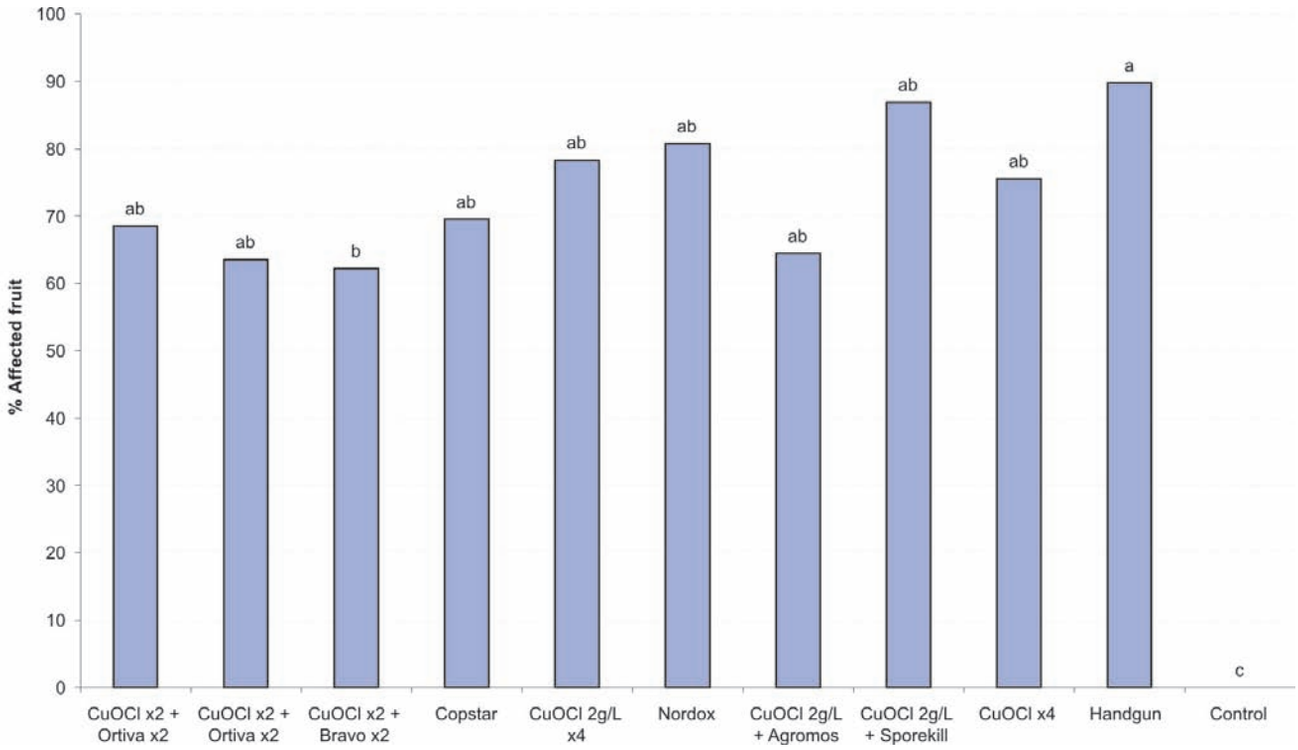

Figure 3. Percentage fruit affected by visible spray residues in 2004/05.

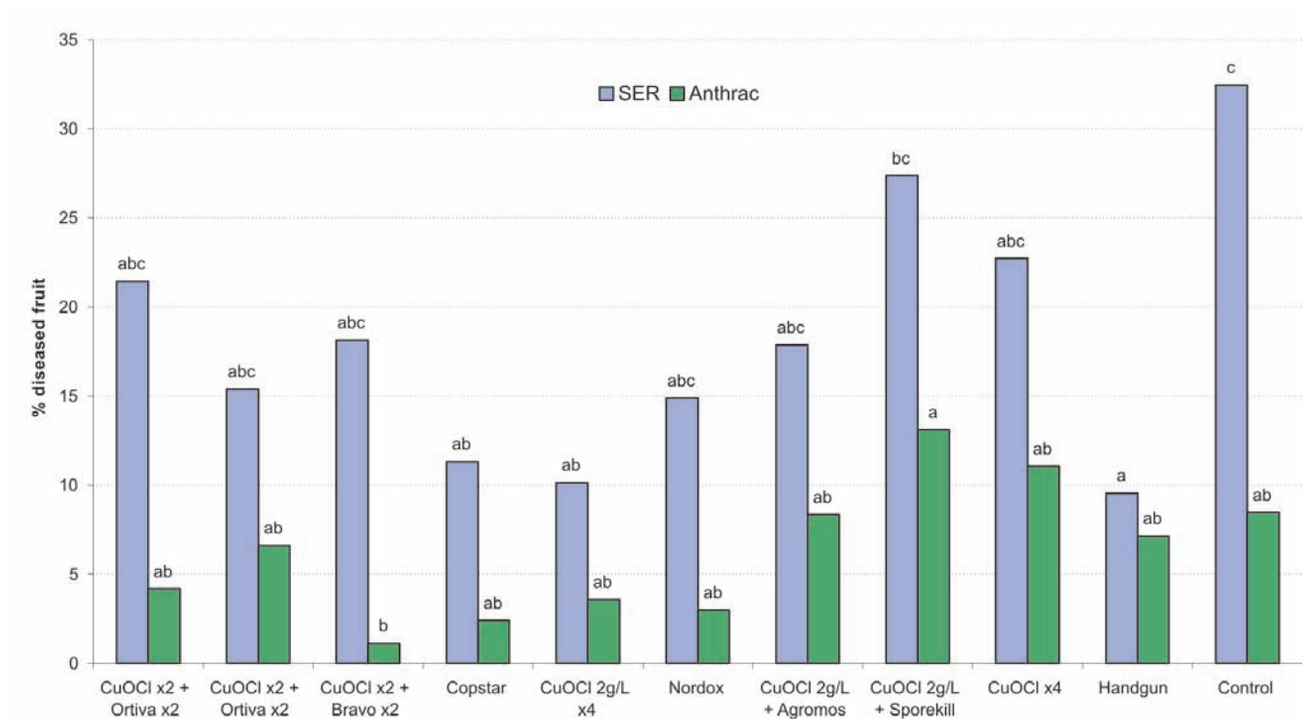

Figure 4. Percentage fruit affected by anthracnose and stem-end rot (SER) in 2004/05.