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

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ABSTRACT

In the 2004/05 season, the best control of Cercospora spot (*PseudoCercospora purpurea*) was obtained with two applications of Ortiva™ (October and November), followed by two applications of Demildex (December and January). Bravo® alternated with Demildex was just as effective. In the 2005/06 season the aim of this project was to further evaluate these alternative fungicides and other copper products for the control of Cercospora spot and post-harvest diseases on 'Fuerte'. The experiment was carried out at Westfalia Estate, and about eight large Fuerte trees pruned into hedge rows were used for each treatment. Two mistblowers were used in combination to apply volumes of 5 500 L/ha to 8 200 L/ha. Fruit were evaluated for the incidence of Cercospora spot, sooty blotch and visible spray residues at the end of May 2006. Fruit samples from each treatment were cold-stored for 28 days, and evaluated for post-harvest diseases and disorders upon ripening. It was a high disease pressure season as indicated by the high incidence of Cercospora spot in the untreated control. The best control of Cercospora spot was obtained when two applications of Ortiva (October and November) were followed by two applications of Demildex (December and January). This treatment was not significantly different from the standard commercial treatment of Demildex applied four times in a season with mistblowers. Incidence of spray residues was similar for both of these treatments, therefore the use of Ortiva in the beginning of the season does not lead to less visible spray residues on the fruit. Incidence of post-harvest diseases was zero in the commercial Demildex treatment and also in the treatment where Ortiva applications were in December and January. Ortiva can be considered an alternative fungicide that can replace two applications of Demildex. Syngenta SA is presently busy with registration trials on avocados.

INTRODUCTION

Alternative products to copper oxychloride have been evaluated at Westfalia Estate since 1999 (Willis, 2005; Willis & Mabunda, 2004; Willis & Duvenhage, 2003; Duvenhage, 2002) and in the 2004/05 season, the best control of Cercospora spot was obtained with two applications of Ortiva™ (October and November) followed by two applications of Demildex (December and January) (Willis, 2006). In the 2003/04 season Bravo® alternated with Demildex was just as effective as the standard Demildex treatment and in the 2004/05 season the same treatment was as effective as the Ortiva / Demildex treatment mentioned above (Willis, 2005 & 2006).

Since both these products showed potential as alternative fungicides that could replace two Demildex applications in a season, and both have proven efficacy against Cercospora organisms on other crops, further evaluation was necessary (Nel *et al.*, 2003). The use of avirulent or attenuated strains of either pathogenic or saprophytic micro-organisms to induce systemic acquired resistance in plants has been well researched (Kùc, 2000). Messenger is a relatively new product (EDEN Bioscience Corp., USA) that is based on the harpin protein derived from the bacterium that causes fire-blight of pear, apple and related plants.

The presence of the harpin protein serves as a signal to the host plant that a pathogen is present. This "host recognition" leads to an activation of biochemical defenses throughout the plant that can reduce disease development and new infections, a phenomenon known as systemic acquired resistance (SAR) (Terry & Joyce, 2004). This induced resistance could provide systemic protection against infection, to substitute for, or supplement control by standard fungicides (Johnston *et al.*, 2004). Another means of reducing the amount of copper applied to our orchards is by reducing the application volumes currently used, but avocado growers face particular challenges when it comes to achieving coverage of very large trees. The use of super-spreader adjuvants has allowed growers to reduce pesticide spray volumes and improve pest control in a variety of crops, e.g. onions, potatoes, kiwi fruit and grapes (Gaskin *et al*., 2002). Therefore the addition of a super-spreader like Break-thru® could counteract the effect of reduced coverage when spray volumes are reduced. The long term aim of this project was to reduce the amount of copper applied to orchards by further evaluation of alternative fungicides, additives and copper products for the control of Cercospora spot 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 Estate for large Fuerte trees. Ortiva™ (Azoxystrobin, Syngenta [Pty] Ltd) applied in various programs with Demildex (Copper oxychloride, Delta Chemicals [Pty] Ltd) and on it's own; Bravo® 720SC (Chlorothalonil, Syngenta [Pty] Ltd) alternated with Demildex; Copstar 120 SC (Copper hydroxide, Agchem Africa [Pty] Ltd); Messenger (Harpin protein, AroBiz Africa [Pty] Ltd) alternated with Demildex; Break-thru® (Polyether-polymethylsiloxane-copolymer, Degussa Africa [Pty] Ltd) added to lowered volumes of Demildex and a lowered rate of Demildex (2 g/L) were compared with the standard Demildex rate (3 g/L) and with a lower volume application of Demildex (4 000 L/ha) (**Table 1**).

The experiment was carried out in a high disease pressure orchard on Westfalia Estate. Trees were about 26 years old and planted at a spacing of 10 m x 10 m (<100 trees / ha). A row of about eight trees was used for each treatment and treatments were applied using an Ultima mistblower and a Bateleur mist-

blower in order to obtain efficient coverage of the large trees. Two buffer rows were allowed between each treated row in the block. The trial was harvested at the end of May 2006 in order to allow for maximum disease development. In each treatment, 20 fruit from each quarter of the tree canopy from each of the data trees were evaluated for the incidence of Cercospora 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

It was a high disease pressure season as indicated by the high incidence of Cercospora spot in the untreated control (**Figure 1**). The best control of Cercospora spot was obtained with two applications of Ortiva (October and November) followed by two applications of Demildex (December and January). The control obtained with this treatment was not significantly different from Ortiva alternated with Demildex, nor from the commercial standard treatment of Demildex (3 g/L) applied four times in a season. Two applications of Demildex (October and November) followed by two applications of Ortiva (December and January) was ineffective in controlling Cercospora spot, as was Ortiva applied on it's own. Bravo alternated with Demildex was less effective (9.6% Cercospora spot) than two applications of Ortiva followed by two applications of Demildex (3.2% Cercospora spot), but the difference was not statistically significant. Previous work showed that there was no difference between Bravo and Ortiva when they were applied in a program with Demildex (Willis, 2006).

Copstar, Demildex alternated with Messenger and the lowered volumes of Demildex with Break-thru treatments all achieved a similar level of control, which amounted to about 10% less control than the standard commercial and best treatments, however this difference was not statistically significant.

The addition of Break-thru to the lowest volume of Demildex (4 000 L/ha) did result in better control when compared to 4 000 L/ha Demildex without Break-thru, but this was not a significant difference. However, when comparing these treatments to the commercial standard treatment, the lower volumes with Break-thru did not provide sufficient control. Gaskin *et al.* (2004) found that the use of a super-spreader adjuvant achieved equivalent spray deposits on avocado fruit when using 3-5 times less spray volume than standard practice. The authors did not, however, report on disease incidence in this study.

Incidence of spray residues was similar for two applications of Ortiva followed by two applications of Demildex and the standard commercial treatment, therefore use of Ortiva in the beginning of the season does not lead to significantly less visible spray residues on the fruit at harvest. In contrast, when Ortiva was

Table 1: Treatments and amount of copper applied per ha per year in the 2005/06 season.

Tmt	Oct 05	Nov 05	Dec 05	Jan 06	Cu/ha/yr
1	Ortiva 0.3ml/L 5500L/ha	Ortiva 0.3ml/L 5500L/ha	Demildex 3g/L 8200L/ha	Demildex 3g/L 8200L/ha	24.6
2	Demildex 3g/L 8200L/ha	Demildex 3g/L 8200L/ha	Ortiva 0.3ml/L 5500L/ha	Ortiva 0.3ml/L 5500L/ha	24.6
3	Ortiva 0.3ml/L 5500L/ha	Demildex 3g/L 8200L/ha	Demildex 3g/L 8200L/ha	Ortiva 0.3ml/L 5500L/ha	24.6
4	Ortiva 0.3ml/L 5500L/ha	Demildex 3g/L 8200L/ha	Ortiva 0.3ml/L 5500L/ha	Demildex 3g/L 8200L/ha	24.6
5	Demildex 3g/L 8200L/ha	Bravo 3ml/L 5500L/ha	Demildex 3g/L 8200L/ha	Bravo 3ml/L 5500L/ha	24.6
6	Ortiva 0.3ml/L 5500L/ha	Ortiva 0.3ml/L 5500L/ha	Ortiva 0.3ml/L 5500L/ha	Ortiva 0.3ml/L 5500L/ha	0
7	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
8	Demildex 3g/L 8200L/ha	Messenger 8200L/ha	Demildex 3g/L 8200L/ha	Messenger 8200L/ha	24.6
9	Demildex 3g/L +Brk-thru 0.25ml /L 6000L/ha	Demildex 3g/L +Brk-thru 0.25ml /L 6000L/ha	Demildex 3g/L +Brk-thru 0.25ml /L 6000L/ha	Demildex 3g/L +Brk-thru 0.25ml /L 6000L/ha	36
10	Demildex 3g/L +Brkthru 0.25ml /L 4100L/ha	Demildex 3g/L +Brkthru 0.25ml /L 4100L/ha	Demildex 3g/L +Brkthru 0.25ml /L 4100L/ha	Demildex 3g/L +Brkthru 0.25ml /L 4100L/ha	24
11	Demildex 3g/L 4100L/ha	Demildex 3g/L 4100L/ha	Demildex 3g/L 4100L/ha	Demildex 3g/L 4100L/ha	24
12	Demildex 2g/L 8200L/ha	Demildex 2g/L 8200L/ha	Demildex 2g/L 8200L/ha	Demildex 2g/L 8200L/ha	32.8
13	Demildex 3g/L 8200L/ha	Demildex 3g/L 8200L/ha	Demildex 3g/L 8200L/ha	Demildex 3g/L 8200L/ha	49.2
14	Untreated				

applied at the end of the season (December and January), significantly less spray residues were visible on the fruit at harvest (**Figure 2**). The lowered volume application of Demildex (4 000 L/ha) with Break-thru resulted in significantly less spray residues at harvest than the commercial standard treatment. This implies that spray coverage was less efficient in this treatment, which is in contrast with the findings of Gaskin *et al.* (2004). Incidence of sooty blotch was high in all treatments and differences between treatments were not significant (results not shown).

Incidence of post-harvest diseases was zero when Ortiva was applied in December and January, however this treatment was ineffective for Cercospora spot control. Anthracnose incidence was high in the Demildex / Bravo, Ortiva alone and Copstar treatments. Stem-end rot was also high in these treatments, as well as in the untreated control. The addition of Break-thru to lowered volumes of Demildex reduced stem-end rot incidence to zero. This treatment could be useful on other cultivars, such as 'Hass', which is not very susceptible to Cercospora spot (**Figure 3**).

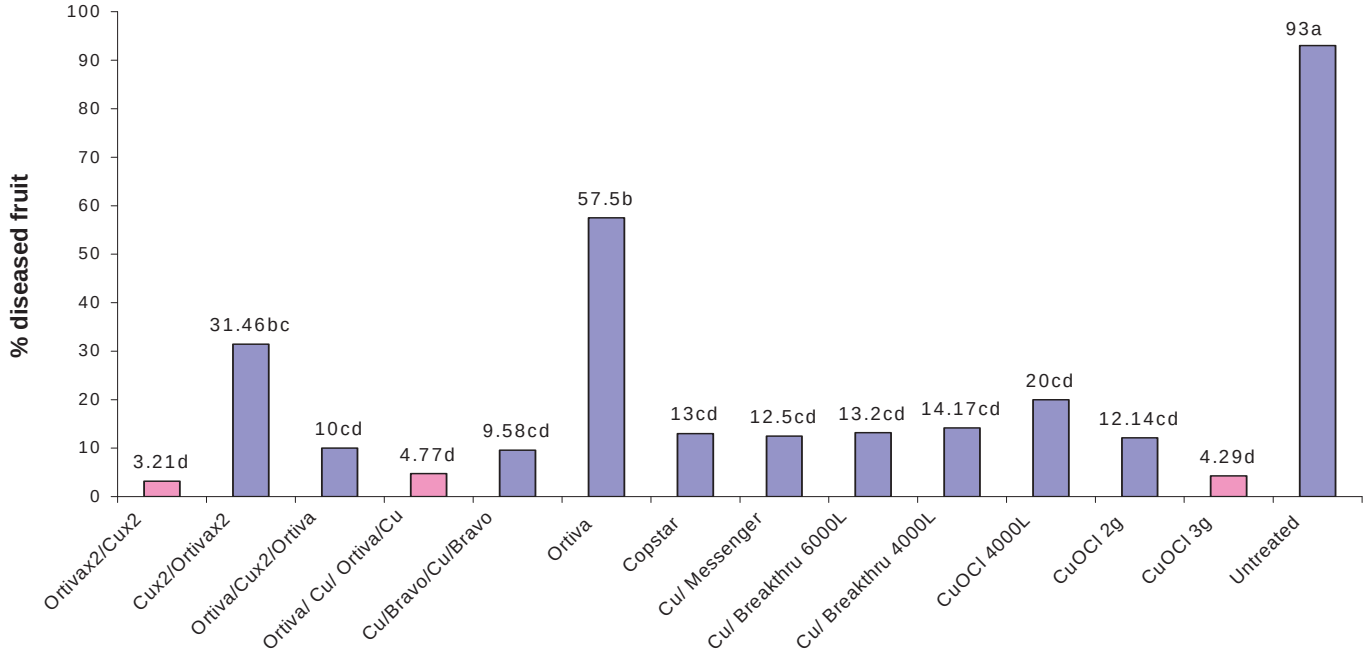

Figure 1: Percentage fruit affected by Cercospora spot in 2005/06 (CuOCl or Cu = Demildex).

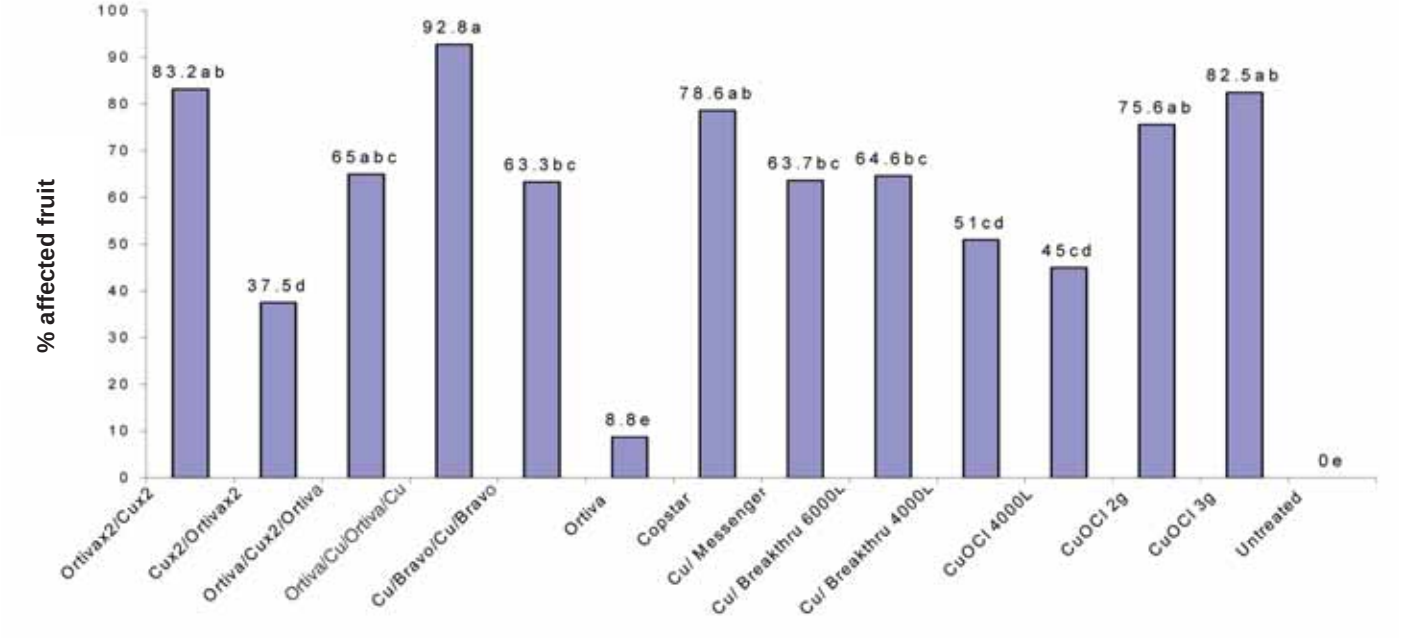

Figure 2: Percentage fruit affected by visible spray residues in 2005/06 (CuOCl or Cu = Demildex).

CONCLUSIONS

This is the second season in which Ortiva was shown to be a feasible alternative fungicide that could replace two applications of copper oxychloride (Demildex) in a spray program. Bravo, when alternated with Demildex, was less effective for the control of both Cercospora spot and post-harvest diseases in this study. Based on these findings Syngenta South Africa is pursuing the registration of Ortiva on avocados. It must be noted that the use of strobilurin fungicides must be managed in a manner which reduces resistance development. This is done by limiting their use and by using them as a component of an integrated program with other fungicides.

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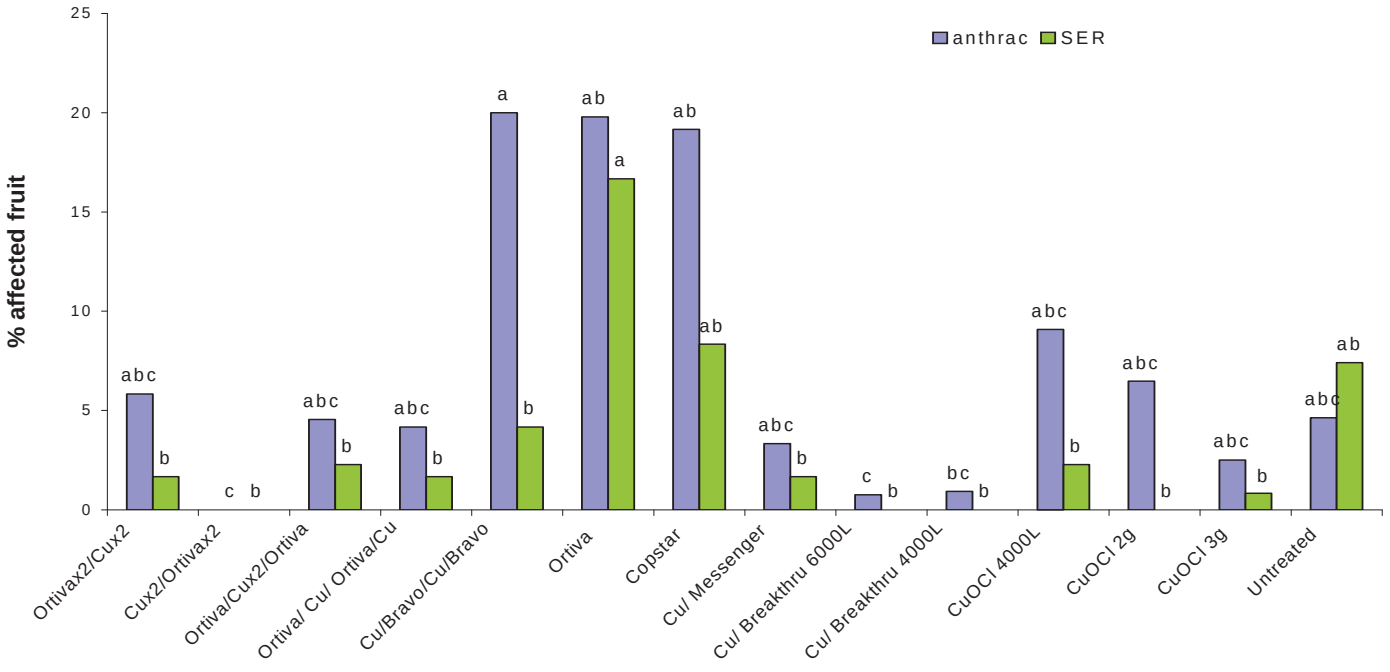

Figure 3: Percentage fruit affected by anthracnose and stem-end rot (SER) in 2005-06 (CuOCl or Cu = Demildex).