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Compare the efficacy of conventional spraying equipment with Electrostatic Spraying System (ESS), when applying standard fungicide programmes, for controlling mango diseases.

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Aim

The aim of this project was to compare the efficacy of fungicides applied with new generation spraying equipment with conventional spraying equipment when application volumes are reduced.

Materials and Methods

The trial was conducted at Maradadi Estates, Letsitele Valley, Limpopo Province on a commercial orchards, cv. Kent with 714 trees/ha. The standard fungicide programme of Maradadi Estates was sprayed with conventional spraying equipment (Eagle sprayer) and the Electrostatic Spraying System (ESS) at different active ingredient dosages. The programme consisted of two systemic fungicides, mainly for control of powdery mildew (applied by producer), followed by copper applications every two weeks, until three weeks before harvest for control of bacterial black spot, anthracnose (ANT), stem-end rot (SER) and soft brown rot (SBR). The first systemic application, Tilt (propiconazole, a.i. 250 g/ℓ) was sprayed on the 29th of August 2008 and 19th of September 2008 by the producer. The first copper application, Nordox (Cuprous oxide, 860 g/kg WG), was applied on the 1st of October 2008, followed by a round every 14 days. The last copper round was sprayed on the 4th of February 2009. Test materials, dosages and volumes sprayed are depicted in **Table 1**. Efficacy of fungicide programs were evaluated at harvest by picking 30 fruit from each of five data trees on the 12th of February 2009. Fruit was washed in a 200 parts per million (ppm) chlorine solution (pH = 6.5), subjected to simulated export conditions (28 days at 8 °C, RH = 85%) and evaluated for decay (anthracnose [ANT] and stem-end rot [SER] / soft brown rot [SER]) at 0, 7 and 14 days after removal from cold storage.

Table 1. Test material compared at Maradadi Estates in the Letsitele Valley as a semi-commercial pre-harvest applications.

Program number	Fungicide programme	Programme description	Dosage per 100 ℓ	Dosage per hectare	Active ingredient applied per hectare	Volume sprayed per ha
1	Punch C or	ESS 80	-*	90 mℓ	Nordox	180 ℓ
	Tilt or		-	120 mℓ	1500 g	
	Nordox 85 WG		1440 g	1800 g		
2	Punch C or	ESS 100	-*	108 mℓ	Nordox	180 ℓ
	Tilt or		-	144 mℓ	1800 g	
	Nordox 85 WG		1800 g	2160 g		
3	Punch C or	Eagle Sprayer	15 mℓ	126 mℓ	Nordox	2000 ℓ
	Tilt or		20 mℓ	168 mℓ	1800 g	
	Nordox 85 WG		90 g	2520 g		
4	Untreated control	-	-	-	-	-

* ESS = Electrostatic Spraying System. ESS 80 and 100 the percentage applied of the total amount of active ingredient as applied with the conventional Eagle application at 2000 ℓ per hectare. Punch C & Tilt applied by producer with Eagle.

Results and Discussion

Anthracnose

The infection potential was very high in this trial, with 95.6 % of untreated fruit showing decay symptoms at the 7-day evaluation. The evaluation of fruit at 0 and 7 days after removal from cold storage showed that Program 2 (ESS 100) the percentage Anthracnose decay statistically significantly reduced compared to Program 1 (ESS 80), Program 3 (Eagle, conventional sprayer) and the untreated control (**Figure 1**). The percentage Anthracnose control achieved by Program 1 (ESS 80) and Program 3 (Eagle, conventional) did not differ significantly from each other or the untreated control. The application of Nordox with the ESS sprayer at 1.8 kg / ha (Program 2) significantly reduced the percentage decay by up to 24.5 % compared to the untreated control, and up to 17.8 % compared to the conventional spraying equipment (Program 3 @ 1.8 kg Nordox / ha). No disease free fruit were observed during the 14 days evaluation (days after removal from cold storage).

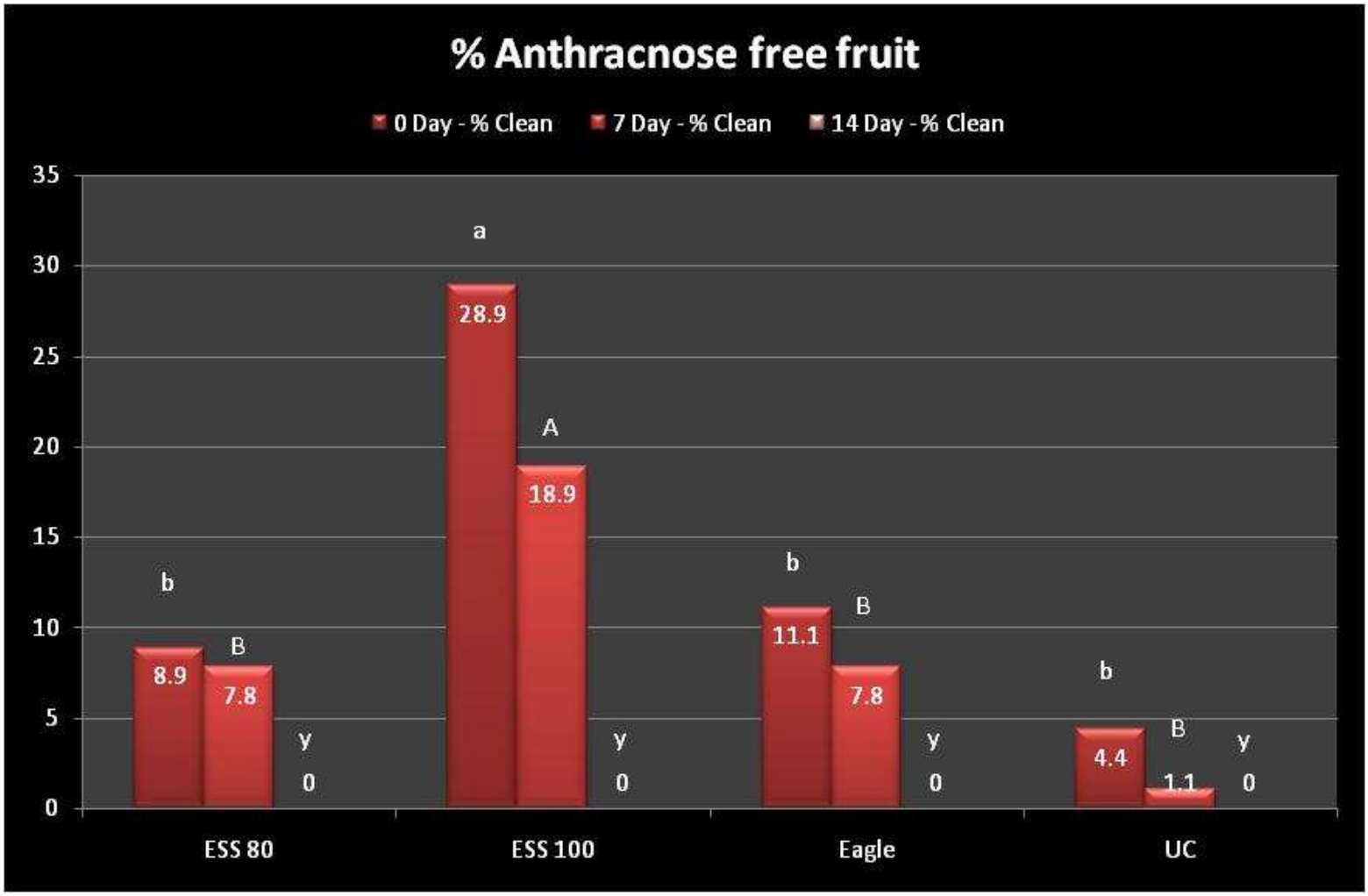

Figure 1. The average percentage Anthracnose free fruit, evaluated 0, 7 and 14 days after removal of export simulation.(no post-harvest dip treatment) (Bars followed by the same alphabetical letter do not differ according to Fishers' protected t-test at the 5 % level of significance)

Stem-end rot / Soft brown rot

The high Anthracnose infection masked the true Stem-end rot / Soft brown rot infection. Evaluation of fruit 0 days after removal from export simulated conditions showed no significant differences between fungicide programs (**Figure 2**). The 7 and 14 day evaluations showed that all fungicide programs significantly reduced the percentage Stem-end / Soft brown rot compared to the untreated control. No significant differenced regarding the control of Stem-end / Soft Brown rot was observed between the ESS 80 (Program 1), ESS 90 (Program 2) and Eagle (Program 3, conventional sprayer) under specific trial conditions

Graph 2. The average percentage Stem-end rot / Soft brown rot free fruit evaluated 0, 7 and 14 days after removal from export simulations.(no post-harvest dip treatment) (Bars followed by the same alphabetical letter do not differ according to Fishers' protected t-test at the 5 % level of significance)

Conclusion

Results obtained during a previous trial indicated that the best control of post-harvest mango diseases was obtained when the active ingredient of fungicides applied with the ESS was reduced with 20% (80 % of a.i. applied with a conventional Cima sprayer). Under the high disease (Anthracnose) pressure experienced in this trial, results showed that the best control was achieved with he ESS sprayer at 1.8 kg .ha (Identical volume Nordox as applied with the conventional sprayer, Program 3). Results showed that Program 2 (ESS 100) resulted in significantly better control of Anthracnose compared to the reduced volumes Nordox (1.4 kg / ha) being applied with the ESS sprayer (Program 1) or the application of Nordox with the conventional sprayer (Program 3, Eagle) at 1.8 kg Nordox / ha. No significant differences were observed between programs regarding the control of Stem-end / Soft brown rot in this trial.

However all program significantly reduced the percentage Stem-end / Soft brown rot compared to the untreated control.

Results clearly show that the application of copper with the ESS sprayer the efficacy of such a fungicide regarding the control of the target diseases significantly increased. The reduction of fungicide being applied by the ESS sprayer under high disease pressures is not recommended.