South African Avocado Growers' Association Yearbook 1994. 17:49-52

CONTROL OF BLACK SPOT OF AVOCADO BY ORGANIC AND INORGANIC FUNGICIDES

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ABSTRACT

Several organic and inorganic fungicides and different methods of application were evaluated for control of black spot and sooty blotch in an attempt to decrease visible spray deposits on avocado fruit at harvest. Treatments were applied on two dates, i.e. during November 1992, and January 1993. Applications of copper oxychloride (255g a.i./100 ℓ) at the first date, followed by either copper oxychloride (170g a.i. /100 ℓ), copper ammonium carbonate, or cyproconazole at the second date, controlled black spot and sooty blotch effectively, and caused less visible spray deposits when compared to coppe roxychloride (255g a.i./100 ℓ) applied at both dates. Application of triadimenol EC stem injections at both dates also controlled black spot and sooty blotch effectively while causing less visible spray deposits when compared to application of copper oxychloride (255g a.i. / 100 ℓ) at both dates.

UITTREKSEL

Sekere organlese en anorganiese swamdoders en verskillende toedieningsmetodes is geëvalueer vir beheer van swartvlek en roetvlek in 'n poging om sigbare spuitneerslag op avokadovrugte met oes te verminder. Behandelings is toegedien op twee datums; gedurende November 1992, en Januarie 1993. Toedienings van koperoksichloried (255g a.b. / 1001) tydens die eerste datum, gevolg deur koperoksichloried (170g a.b. / 100 l), koperammoniumkarbonaat, of cyproconazole tydens die tweede datum, het swartvlek en roetvlek effektief beheer, en minder sigbare spuitneerslag veroorsaak wanneer vergelyk met koperoksichloried (255g a.b. /1001) toegedien tydens beide datums. Toediening van triadimenol EC staminspuitings tydens beide datums het ook swartvlek en roetvlek effektief beheer terwyl minder sigbare spuitneerslag veroorsaak iswanneer vergelyk met toediening van koperoksichloried (255g a.b. / 1001) tydens beide datums.

INTRODUCTION

Black spot, caused by *Pseudocercospora purpurea* (Darvas & Kotzé, 1979), and sooty blotch, caused by *Akaropeltopsis* sp. (Smith, Kotzé & Wehner, 1985), are currently controlled by timely application of copper oxychloride sprays. However, this treatment leaves unsightly spray deposits on the fruit which have to be removed before fruit are acceptable for export. This cleaning of fruit is done in the packhouse and can slow down the speed of packing by as much as 50% (Dr. J.J. Bezuidenhout, personal

communication). Further-more, foliar application of fungicides cannot be carried out during prolonged rainy conditions and so timely application of fungicides can be difficult to achieve. However, these problems may be overcome by using other fungicides or alternative methods of application.

The purpose of this study was to evaluate organic and inorganic fungicides, and different methods of application for control of black spot and sooty blotch, and aimed at reducing the visible spray deposits left on the fruit.

MATERIALS AND METHODS

A Fuerte orchard which was planted during 1980 was used for the trial. Seven replicate trees, laid out in a randomised block design, were used for each treatment (Table 1). Spray applications were made by using high volume, hand-held spray guns. Triadimenol GR granules were applied evenly to the drip area under the trees, while triadimenol EC was injected into the trunk according to the method described by Darvas, Toerien and Milne (1983); using 60ml plastic syringes, each containing 20ml of a 2,5% triadimenol / methanol solution (v/v). Chemicals used in the trial were:

Copper ammonium carbonate SL (661 g/ℓ)
Copper oxychloride WP (850g/kg)
Copper oxychloride SC (500g/ℓ)
Cyproconazole SL (50g/ℓ)
Triadimenol GR (10g/kg)
Triadimenol EC (250g/ℓ)

The rates at which chemicals were applied are given in Table 1.

Fruit was harvested on the 15th of June and evaluated for the occurrence of black spot, sooty blotch, and visible spray deposits, by rating according to the following scales:

Blackspot:
0 = No visible sign of disease
1 = 1-5 spots
2 = 6-10 spots
3 = more than 10 spots

Sooty blotch:
0 = No visible sign of disease
1 = less than 20% of fruit affected
2 = 20 50% of fruit affected
3 = more than 50% of fruit affected

Visible spray deposits:
0 = No visible spray deposits
1 = less than 20% of fruit affected
2 = 20 50% of fruit affected
3 = more than 50% of fruit affected

From each tree one carton of fruit (count 14 to 16) was packed and stored for four weeks at the specified temperature for sea export. Fruit were then ripened at 18°C and evaluated for post-harvest diseases and physiological disorders. Results were

expressed using an index of 0 (totally unaffected) to 10 (100% of fruit area affected by the disease or disorder in question).

TABLE 1: Treatments applied at different spray doses.

TREATMENT	TREATMENT APPLIED ON 92-11-17		TREATMENT APPLIED ON 93-01-13	
ABBREVIATION	CHEMICAL	RATE	CHEMICAL	RATE
C	Control	-	Control	-
Cu	Cu-oxychloride WP	* 255g	-	-
Cu/Cu	Cu-oxychloride WP	* 255g	Cu-oxychloride WP	*255g
Cu/Cu (170)	Cu-oxychloride WP	* 255g	Cu-oxychloride WP	*170g
Cu/CC (198)	Cu-oxychloride WP	* 255g	Cu-ammoniumcarbonate SL	*198g
Cu/CC(330)	Cu-oxychloride WP	* 255g	Cu-ammoniumcarbonate SL	* 330g
Cu/B	Cu-oxychloride WP	* 255g	Triadimenol GR	# 0,04g
B/Cu	Triadimenol GR	# 0,04g	Cu-oxychloride WP	* 255g
B/B	Triadimenol GR	# 0,04g	Triadimenol GR	# 0,04g
2B	Triadimenol GR	#0,08g	-	-
Cu/Cy	Cu-oxychloride WP	* 255g	Cyproconazole SL	*1,5g
Cu/Cu (SC)	Cu-oxychloride WP	*255g	Cu-oxychloride SC	*255g
Inj/Inj	Triadimenol EC	# 0,04g	Triadimenol EC	#0,04g

* Rate of active ingredient used per 100 ℓ of H_20 sprayed on the tree.

\# Rate of active ingredient used per square metre of drip area under the tree.

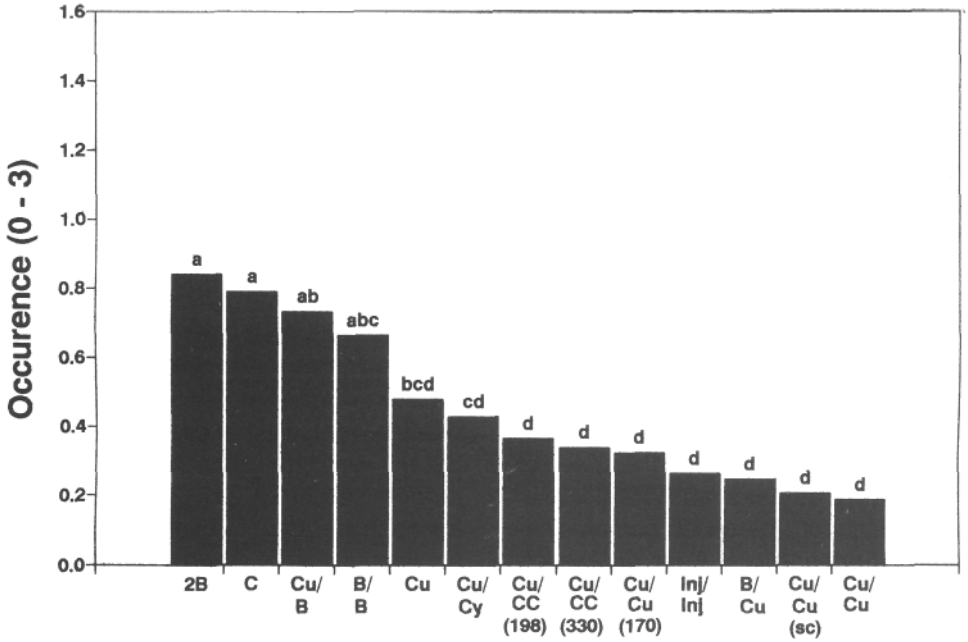
RESULTS

Black spot (Fig. 1)

The control treatment and triadimenol GR at the first date only, at both dates, or following copper oxychloride, resulted in a significantly higher incidence of black spot when compared to application of the standard Cu-oxychloride (255g a.i. / 100ℓ) at both dates (Fig. 1). Occurence of black spot in all other treatments did not differ significantly from each other or from Cu-oxychloride (255g a.i./ 100 ℓ) at both dates (Fig. 1).

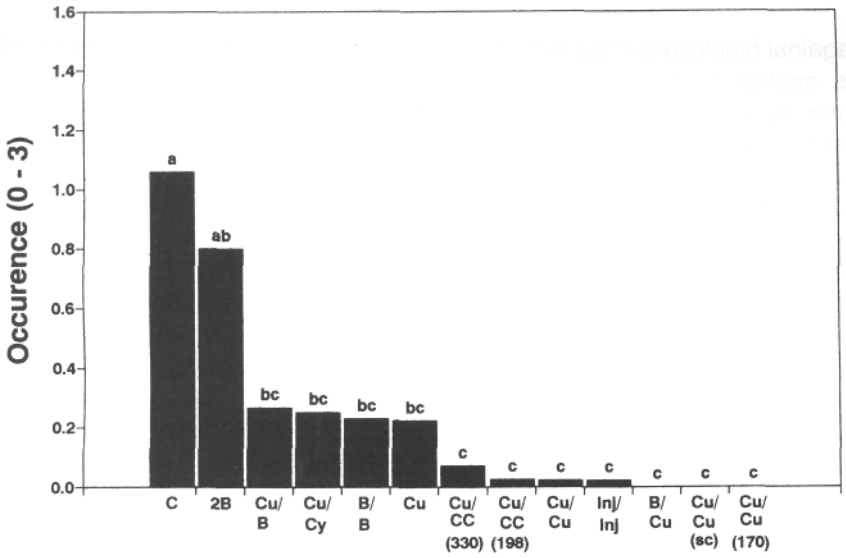
Sooty Blotch (Fig. 2)

Application of triadimenol GR at the first date only, resulted in a higher incidence of sooty blotch when compared to all treatments except the control, and treatments receiving triadimenol GR, cyproconazole or no treatment at the second date (Fig. 2). Incidence of sooty blotch of all treatments except the control, and treatment with triadimenol GR at the first date only, did not differ significantly from each other (Fig. 2).



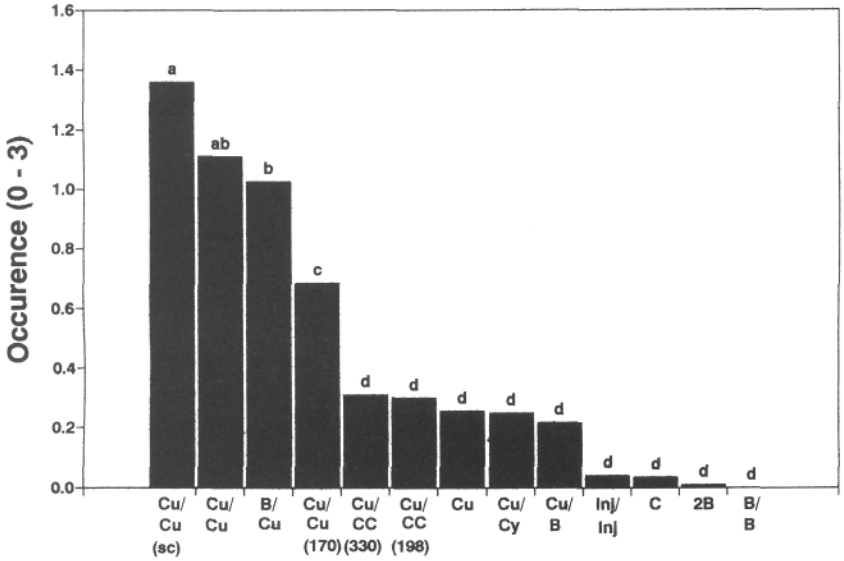
Values not followed by the same letter are significantly different according to Duncan's multiple range test (P=0,05).

FIG 1. The effect of pre- harvest treatments on black spot



Values not followed by the same letter are significantly different according to Duncan's multiple range test (P=0,05).

FIG 2. The effect of pre- harvest treatments on sooty blotch



Values not followed by the same letter are significantly different according to Duncan's multiple range test (P=0,05).

FIG 3. Visible spray residues resulting from pre-harvest treatments

Visible spray deposits (Fig. 3)

Application of Cu-oxychloride sprays at 255g a.i. / 100ℓ at the second spray date resulted in significantly more visible spray deposits when compared to treatments receiving Cu-ammonium carbonate, Cu-oxychloride (170g a.i. / 100ℓ), triadimenol (GR, or EC injections), cyproconazole, or no chemical at the second spray date (Fig. 3). Applying chemicals other than Cu-oxychloride, or no chemical at the second spray date, resulted in significantly less visible spray deposits when compared to treatments receiving Cu-oxychloride (at 255g a.i./100ℓ, or 170g a.i./100ℓ) during the second spray date (Fig. 3).

Post-harvest diseases and physiological disorders

No significant difference in postharvest diseases or physiological disorders of fruit from the different treatments occurred (results not shown).

DISCUSSION

Although efficacies of cyproconazole and Cu-ammoniumcarbonate have been shown previously (Lonsdale, 1991; 1992), results of this study indicate efficacy at lower dosages. In agreement with Lonsdale (1991;

11992) significantly less visible spray deposits resulted when Cu-ammonium carbonate or cyproconazole were applied at the second date, when compared to treatments receiving Cuoxychloride at the second date.

Application of Cu-oxychloride at a lower rate (170g a.i./100ℓ) at the second spray date gave good control of black spot and sooty blotch, and significantly less spray deposits, when compared to application of Cu-oxychloride at the standard rate (255g a.i./100ℓ) at the second spray date. This result is promising and can be easily implemented. The fact that one application of Cuoxychloride did not result in significantly increased incidence

of black spot and sooty blotch when compared to treatments receiving applications at both dates, must be seen in the light of the general low disease incidence of the season. Therefore, application of only one treatment of Cu-oxychloride cannot be recommended.

High incidence of black spot and sooty blotch with application of triadimenol GR at the first application date only, contrasted with the level of control of both black spot and sooty blotch by application of triadimenol GR at the first date and Cu-oxychloride at the second date, suggests that fruit may not be adequately protected against black spot and sooty blotch during the later part of the season. Lack of black spot control by triadimenol GR when applied at the second date may be due to the chemical reaching the fruit too late to offer protection against black spot (triadimenol GR was applied to the soil at the same time as foliar applications of other chemicals). In future applications of triadimenol GR this treatment will be applied an adequate time before foliar application of Cu-oxychloride are due, to allow sufficient time for translocation of the chemical from the roots to the fruit.

Injection of triadimenol EC into the trunk was very effective in controlling black spot and sooty blotch, with the advantage of leaving no spray deposits. Therefore, disease control by this method is very promising and will receive attention in future trials.

ACKNOWLEDGEMENTS

The author wishes to thank the management of Westfalia Estate for making an orchard available for the trial, and Mr. J.J. van Rensburg (Westfalia Estate), and Mrs. E. de Villiers (University of Pretoria) for technical assistance. The financial support of SAAGA and the supplying of chemicals by Bayer, Hygrotech, Kynoch and Sandoz are appreciated.

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