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# CONTROL OF POST-HARVEST DISEASES ON AVOCADO FRUIT BY FUNGICIDES WITH SPECIAL EMPHASIS ON TECTO AND BENLATE

**J.M. Darvas**
*Westfalia Estate*

## INTRODUCTION

Avocado fruit is often subject to fungal attacks during ripening. The two most common post-harvest diseases are anthracnose and stem-end rot. Anthracnose is caused by *Colletofrichum gloeosporioides,* while pathogens involved in stem-end rot were found to be *Nectria* sp., *Phomopsis* sp. *Dothiorella* sp. *C. gloeosporioides, Pestalotia* sp. and rarely *Fusarium solani.* The first mentioned and the most important stem-end rot causing agent, *Nectria* sp. is usually seen in its *Tubercularia* conidial stage. There is sometimes a correlation between severe stem-end rot, anthracnose and vascular browning. Chilling injury (or cold damage) is caused by low temperatures and although the cause of pulp spot and lead discolouration is not known, observations were also made on these phenomena.

The results were obtained from the external and internal assessment of some 10 000 fruit which received various post-harvest treatment. All experiments were undertaken by Westfalia Estate.

## INVESTIGATIONS

Three large experiments were conducted between 31 March and 3 May 1977.

### *Materials and Methods*

TBZ (Tecto) containing 45,1% a.i. Thiabendozole in E.C. form

Topsin containing 65% a.i. Thiophanate in W.P. form

Bavistin containing 50% a.i. Carbendazim in W.P. form

Benomyl (Benlate) containing 50% a.i. Benomyl in W.P. form

Aliette containing 80% a.i. LS 74-783 in W.P. form

Rovral containing 50% a.i. 26,019 RP in W. P. form

Acetric acid

Wax (TAG)

Orcher oil

The above listed chemicals were added to the wax solution (TAG) which was used commercially on fruit. After dipping fruit into the fungicide and wax solution it was air dried and packed. Subsequent cold storage followed which lasted 28 days. Assessment of results was carried out on ripe fruit, usually 5 days later, or approximately 33 days after treatment. Fuerte avocados from Westfalia section ISA were used for all treatments. The average oil content was 14,0%to 19,1%. All treatments were replicated 4 times (5 times in second experiment) with 15 fruit per replicate.

## DISCUSSION

In regard to the fungicida! control of pathogenic post-harvest diseases, as indicated by results in Table 1, Benomyl and TBZ gave the best control of anthracnose and stem-end rot.

Further tests were undertaken with these fungicides on stored avocado fruit. In general, Benomyl performed very well, being particularly effective on *Colletotríchum gloeosporioides.* There was, however, considerable cold damage recorded on fruit treated with Benlate early in the picking season. This phenomenon did not occur when oil content of fruit exceeded 19%*.*

Cold damage was usually low on fruit treated with this TBZ regardless of the oil content.

It was noted in earlier experiments that acetic acid partially controlled anthracnose. However, as is shown by the results in Tables 2 and 3 acetic acid decreased the effectiveness of the chemicals on *C. gloeosporioides.*

Oil was also tested as an additive to fungicides to increase systemic action of TBZ and Benomyl. It improved the effectiveness of TBZ but at the same time caused higher chilling injury.

From the handling point of view, TBZ was found easier to mix with the wax than Benomyl.

**Table I**

*Results of an experiment where different compounds were screened against post-harvest diseases*

| Treatment | Diseases on ripe fruit (rated from 0 to 10) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | External | | | Internal | | | | | |
| | Chilling injury | Anthrac-nose | Stem-end rot | Anthrac-nose | Stem-end rot | Pulp spot | Vascular browning | Lead discolour | Ripeness |
| 1. Unwaxed control | 1,34 | 0,09 | 0,59 | 0,17 | 0,60 | 0,12 | 0,12 | 0,00 | 7 |
| 2. Waxed control | 0,73 | 0,10 | 0,20 | 0,23 | 0,50 | 0,25 | 0,23 | 0,00 | 2 |
| 3. Aliette 0,375% in wax | 0,74 | 0,19 | 0,30 | 0,08 | 0,27 | 0,16 | 0,14 | 0,00 | 5 |
| 4. Bavistin 0,37% in wax | 2,07 | 0,30 | 0,16 | 0,16 | 0,16 | 0,01 | 0,00 | 0,01 | 8 |
| 5. Benlate 0,1% in wax | 0,90 | 0,13 | 0,00 | 0,03 | 0,00 | 0,01 | 0,00 | 0,00 | 4 |
| 6. Rovral 0,2% in wax | 0,67 | 0,32 | 0,22 | 0,38 | 0,32 | 0,24 | 0,03 | 0,00 | 3 |
| 7. Tecto 0,3% in wax | 0,17 | 0,08 | 0,03 | 0,17 | 0,03 | 0,01 | 0,05 | 0,00 | 1 |
| 8. Topsin 0,14% in wax | 2,44 | 0,51 | 0,51 | 0,62 | 0,12 | 0,22 | 0,17 | 0,01 | 6 |

Ripeness:
1 = slowest ripening
2 = fastest ripening

**Table 2**

*Effect of various post-harvest treatments on fruit diseases*

| Treatment | Diseases on ripe fruit (rated from 0 to 10) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | External | | | Internal | | | | | |
| | Chilling injury | Anthrac-nose | Stem-end rot | Anthrac-nose | Stem-end rot | Pulp spot | Vascular browning | Lead discolour | Ripeness |
| 1. Tecto 0,3% + oil | 0,18 | 0,20 | 0,00 | 0,10 | 0,01 | 0,07 | 0,23 | 0,00 | 9 |
| 2. Benlate 0,1% + oil | 0,14 | 0,00 | 0,01 | 0,00 | 0,02 | 0,02 | 0,00 | 0,00 | 8 |
| 3. Tecto 0,3% + oil in wax | 0,16 | 0,03 | 0,00 | 0,10 | 0,03 | 0,09 | 0,06 | 0,01 | 5 |
| 4. Benlate 0,1% + oil in wax | 0,20 | 0,00 | 0,02 | 0,04 | 0,04 | 0,08 | 0,00 | 0,00 | 1 |
| 5. Acetic acid 0,5% + Tecto 0,3% + oil in wax | 0,41 | 0,62 | 0,43 | 0,24 | 0,56 | 0,17 | 0,63 | 0,01 | 3 |
| 6. Acetic acid 0,5% + Tecto 0,3% + oil in wax | 0,19 | 0,03 | 0,03 | 0,09 | 0,04 | 0,17 | 0,03 | 0,00 | 2 |
| 7. Acetic acid 0,5% + Benlate 0,1% + oil in wax | 0,41 | 0,31 | 0,06 | 0,50 | 0,15 | 0,43 | 0,24 | 0,01 | 6 |
| 8. Tecto 0,3% in wax | 0,06 | 0,20 | 0,01 | 0,31 | 0,10 | 0,18 | 0,12 | 0,01 | 4 |
| 9. Untreated control | 1,21 | 1,33 | 0,70 | 0,66 | 0,66 | 0,06 | 0,38 | 0,00 | 7 |

Ripeness:
1 = slowest ripening
2 = fastest ripening

**Table 3**

*Effect of wax, TBZ and acetic acid on post-harvest avocado fruit disorders*

| Treatment | Diseases on ripe fruit (rated from 0 to 10) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | External | | | Internal | | | | | |
| | Chilling injury | Anthrac-nose | Stem-end rot | Anthrac-nose | Stem-end rot | Pulp spot | Vascular browning | Lead discolour | Ripeness |
| 1. Tecto 0,3% in wax | 0,52 | 0,03 | 0,01 | 0,02 | 0,05 | 0,30 | 0,10 | 0,01 | 3 |
| 2. Acetic acid 0,5% + Tecto 0,03% in wax | 0,61 | 0,17 | 0,01 | 0,14 | 0,05 | 0,31 | 0,13 | 0,00 | 1 |
| 3. Waxed Control | 0,71 | 0,07 | 0,05 | 0,04 | 0,20 | 0,25 | 0,07 | 0,00 | 4 |
| 4. Untreated control | 0,56 | 0,07 | 0,03 | 0,14 | 0,12 | 0,60 | 0,12 | 0,06 | 2 |

Ripeness:
1 = slowest ripening
2 = fastest ripening