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POST-HARVEST DISEASES OF AVOCADOS

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OPSOMMING

Sommige van die stingelendbederf swamme was op vier avokado kultivars getoets om hulle patogenisiteit te bepaal. Die mees patogeniese spesies was Rhizopus stolonifer, Botryodiplodia theobromae en Colletotrichum gloeosporioides. Fuerte vrugte was die ergste aangetas deur hierdie swamme en Ryan vrugte die minste.

Van die verskillende pakhuis voorbehandelings het waks geneig om die voorkoms van stingelendbederf te verhoog op Fuerte vrugte wat vroeg in Maart gepluk is. Hierdie toename was teengewerk deur die byvoeging van swamdoders (Tecto, Benlate) by die waks. Die doop van die vars gesnyde stingels in 'n waks plus swamdoder oplossing was belowend genoeg teen stingelendbederf om verdere ondersoeke te regverdig.

SUMMARY

Some of the stem-end rot fungi were tested on four avocado cultivars to determine their pathogenicity as fruit rot agents. The most pathogenical species were Rhizopus stolonifer, Botryodiplodia theobromae and Colletotrichum gloeosporioides. Fuerte fruit was the most severely rotted by these fungi white Ryan fruit appeared to be the least affected.

Post-harvest wax treatment in the packhouse increased the incidence of stem-end rot in early (March) picked Fuerte fruit. The addition of fungicides (Tecto, Benlate) to the wax tended to reduce stem-end rot. Field dipping of the freshly cut fruit pedicel into wax plus fungicide solution showed promise for further investigations.

INTRODUCTION

Three major post-harvest diseases were found on avocados at Westfalia Estate. They are stem-end rot, anthracnose and Dothiorella rot. The pathogens involved in stem-end rot are *Thyronectria pseudotrichia, Colletotrichum gloeosporioides, Dothiorella aromatica, Phomopsis perseae* and to a lesser extent *Fusarium decemcellulare, F. sambucinum, F. solani, Pestalotiopsis versicolor, Rhizopus stolonifer and Drechslera setariae.* Anthracnose is caused by *Colletotrichum gloeosporioides*. The causal organism of Dothiorella fruit rot is *Dothiorella aromatica* which is usually associated with

a superficial form of anthracnose (Darvas, 1978).

The pathogenicity of these fungi as stem-end rot agents were tested in post-harvest inoculations (Darvas and Kotzé, 1979).

This is to report on further pathogenicity studies with these organisms as fruit rot agents as well as the incidence of stem-end rot of fruit which received various post-harvest treatments.

MATERIALS AND METHODS

In addition to the fungi that were isolated from stem-end rot, *Fusarium culmorum* isolated earlier from an Edranol fruit spot and *Botryodiplodia theobromae* isolated from a Fuerte branch, were also included in the pathogenicity tests as fruit rotting agents.

Inoculations were made on surface sterilized hard fruit, through wounds inflicted by a sterile blade. The wounds extended just under the epidermis in the middle of freshly picked hard fruit. Spore suspensions of the fungi were used for inoculations. After inoculation wounds were closed with sticky tape and fruit kept at room temperature. The extent of damage was measured by measuring the diameter of the necrotic area in mm.

The effect of some post-harvest treatments on the incidence of stem-end rot pathogens was analyzed on early season (March) Fuerte fruit which did not receive any pre-harvest fungicide sprays. Treatments consisted of dipping the pedicel and a small portion of the fruit at the stem-end into a TAG wax (polyethylene) solution containing Benlate (benomyl 50% WP) at 0,1% a.i. and Tecto (TBZ 45% flowable) at 0,2% a.i. Other treatments were wax and wax plus fungicide applications at the packhouse.

Fruit passed through a series of brush rollers for thorough wax coverage. After treatment fruit was wrapped in cellophane, packed in cartons and cold stored for 28 days at 6°C to simulate commercial handling, after which it ripened at room temperature. Eating-ripe avocados were assessed for stem-end rot and isolations from infected fruit were made on PDA.

RESULTS

TABLE 1: Fruit rot by some of the stem-end rot fungi in artificial post-harvest inoculations

Fungi	Diameter of fruit rot in mm											
	Fuerte			Edranol			Hass			Ryan		
	Days after inoculation			Days after inoculation			Days after inoculation			Days after inoculation		
	5	8	11	5	8	11	5	8	11	5	8	11
Botryodiplodia theobromae	1	10	47	1	35	80	1	12	35	1	15	41
Colletotrichum gloeosporioides	0	5	23	0	12	34	1	14	32	0	2	11
Dothiorella aromatica	0	1	13	0	1	10	0	4	19	0	0	1
Fusarium decemcellulare	1	11	19	2	11	20	1	3	12	1	6	12
Fusarium culmorum	0	1	8	0	1	13	0	3	12	0	0	-
Pestalotiopsis versicolor	0	0	0	0	0	0	0	0	0	0	0	0
Phomopsis perseae	0	0	3	0	1	14	0	1	7	0	0	0
Rhizopus stolonifer	44	97	130	0	16	16	2	16	16	0	0	0
Thyronectria pseudotrichia	0	4	20	0	1	4	0	0	5	0	2	6

TABLE 2: Incidence of stem-end rot pathogens on Fuerte fruit post-harvest treated and evaluated after cold storage

Treatments	% fruit with stem-end rot symptoms	% occurrence			
		Thyronectria pseudotrichia	Colletotrichum gloeosporioides	Dothiorella aromatica	Phomopsis perseae
Wax only	33	78	18	2	2
Tecto 0,2% a.i. in wax	14	83	12	5	–
Benlate 0,05% a.i. + Tecto 0,2% a.i. in wax	14	86	7	7	–
Stem-end dipping in wax + fungicides solution in orchard (no packhouse treatment)	3	–	100	–	–
Control	16	90	5	5	–

DISCUSSION

The most pathogenic fungi causing fruit rot of avocados in artificial post-harvest inoculations were *Rhizopus stolonifer* followed by *Botryodiplodia theobromae* and *Colletotrichum gloeosporioides* (Table 1). *Fusarium decemcellulare, Dothiorella aromatica, Thyronectria pseudotrichia, Fusarium culmorum* and *Phomopsis perseae* appeared to be weak pathogens. *Pestalotiopsis versicolor* caused no rot when

inoculated onto wounded fruit. The aggressiveness of *R. stolonifer* was evident but as in the case of earlier stem-end rot inoculations not all inoculations were successful. This corresponds with earlier work (Darvas and Kotzé, 1979). Fuerte appeared to be the most susceptible cultivar to fruit rot caused by these fungi followed by Edranol, Hass and Ryan. It was noted that many of the inoculated fruit softened considerably faster than un-inoculated fruit. Fungi that interfered with the normal ripening process by inducing abnormally quick softening of fruit were *R. stolonifer, B. theobromae, C. gloeosporioides, F. decemcellulare and D. aromatica.*

In Table 2 the wax only treatment tended to give a higher incidence of stem-end rot. Fruit which were waxed in the packhouse with fungicides added to the wax showed only a marginal decrease in the incidence of stem-end rot as compared to the untreated control, but inhibited the exceptional increase that was induced by the wax only treatment. Dipping the stem-end of fruit into a wax + Benlate + Tecto solution reduced infection to the lowest level of all the treatments and only *C. gloeosporioides* was isolated out of these fruit.

This suggests that *C. gloeosporioides* was present as a latent infection inside the pedicel at the time of picking. Fruit dipping also showed very good control against T. pseudotrichia infections which in turn indicates that the fungus is a wound parasite invading fruit through cut pedicels. These findings as to the latent or wound infections by some of the stem-end rot pathogens are in agreement with our earlier results (Darvas and Kotzé, 1979) and with reports from Australia (Peterson, 1978), California (Home and Palmer, 1935) and Israel (Binyamini and Schiffman — Nadel, 1972).

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