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STEM-END ROT AND OTHER POST-HARVEST DISEASES

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OPSOMMING

Die voorkoms van stingelend-bederf en antraknose was hoar op Fuerte vrugte wat gedurende die reén gepluk is. In die algemeen het stingelendbederf afgeneem fernyl antraknose en Dothiorella/Colletotrichum vrugtevrot toegeneem het later in die plukseisoen.

Stingelend-bederf swamme is voor die oes op Fuerte geinokuleer en slegs Colletotrichum gloeosporioides, Dothiorella aromática, Botryodiplodia theobromae en Fusarium decemcellulare het na-oes siekte veroorsaak wat ontwikkel het op rypwordende vrugte.

Meeste van hierdie organismes kan sommige of al vier kultivars (Fuerte, Edranol, Ftyan en Hass) besmet as die stingels verwyder is, maar slegs Colletotrichum gloeosporioides, Dothiorella aromática, Botryodiplodia theobromae, Phomopsis perseae en Thyronectria pseudotrichia kan die vrug deur die stingel binnedring.

SUMMARY

The incidence of stem-end rot and anthracnose was significantly higher on Fuerte fruit picked during the rain. In general, stem-end rot decreased while anthracnose and Dothiorella Colletotrichum fruit rot increased towards the end of the picking season.

Stem-end rot fungi were pre-harvest inoculated on Fuerte and it was found that only Colletotrichum gloeosporioides, Dothiorella aromática, Botryodiplodia theobromae and Fusarium decemcellulare caused post-harvest diseases, which developed on ripening fruit.

Most of these organisms can infect some or all four cultivars (Fuerte, Edranol, Ryan B Hass) if the stem is removed but only Colletotrichum gloeosporioides, Dothiorella aromática, Botryodiplodia theobromae, Phomopsis perseae and Thyronectria pseudotrichia can invade through fruit stems.

INTRODUCTION

In the past few years considerable work has been done on the isolation, identification and pathogenicity of post-harvest pathogens of avocados in the Tzaneen area (Darvas,

1977; Darvas, 1978).

This investigation has been continued in the past season and includes further pathogenicity studies.

MATERIALS AND METHODS

For fruit inoculations, spore suspensions of the various fungi were prepared from cultures grown aseptically on avocado fruit pieces under UV light. Fruit after pre-harvest inoculations were closed in paper bags on the trees until harvest, to prevent interference with natural infections. The identity of the fungi used in the experiments was confirmed by the Commonwealth Mycological Institute in England. Further details of methods are given under each trial described under Results.

RESULTS

Trial 1

The incidence of various diseases on Fuerte fruit was monitored through the 1979 picking season. Fruit were packed in cellophane and kept in cold storage (6°C) for 28 days and evaluated for post-harvest diseases when soft (Table 1).

TABLE 1: Damage caused by stem-end rot, anthracnose (conventional symptoms) and *Dothiorella-Colletotrichum* complex on Fuerte fruit stored at 6,0°C during the 1979 picking season

Date	Total external and internal damage (rated 0—10)			Picking conditions
	Stem-end rot	Anthracnose	Doth. + Coll. complex	
1979.02.20	5,90	0,68	0,00	wet
1979.03.27	0,94	0,19	0,11	dry
1979.04.11	0,48	0,22	0,09	dry
1979.05.10	0,22	0,15	0,10	dry
1979.05.17	0,12	0,23	0,41	dry
1979.06.28	0,05	0,33	0,25	dry
1979.07.10	0,63	1,15	0,56	wet
Mean	1,19	0,42	0,21	

Trial 2

The pathogenicity of fungi obtained from stem-end rot and also Botryodiplodia theobromae isolated from avocados, were investigated by pre-harvest inoculation followed by post-harvest disease evaluation (Table 2).

TABLE 2: Type of post-harvest diseases on Fuerte fruit inoculated 3—4 months prior to picking, with spore suspensions of the various pathogens

Fungi	External fruit spot or rot symptoms	Stem-end rot	Re-isolation of fungus
Botryodiplodia theobromae	—	+	+
Colletotrichum gloeosporioides	+	+	+
Dothiorella aromatica	+	+	+
Drechslera setariae	—	—	—
Fusarium decemcellulare	+	—	+
Fusarium sambucinum	—	—	—
Fusarium solani	—	—	—
Pestalotiopsis versicolor	—	—	—
Rhizopus stolonifer	—	—	—
Thyronectria pseudotrichia	—	—	—

Trial 3

The pathogenicity of these organisms as stem-end rot agents was also tested in artificial post-harvest inoculations on four cultivars. Inoculations were done through the stem attachment of debuttoned fruit or through 0,5 cm long fruit stems. The degree of stem-end rot was externally and internally assessed on ripe fruit (Tables 3A and 3B).

TABLE 3A: pathogenicity of stem-end rot fungi to various avocado cultivars (Fuerte, Edranol)

Fungi	Average stem-end rot damage (rated from 0—10)							
	Fuerte				Edranol			
	Stemless fruit		0,5 cm long stem		Stemless fruit		0,5 cm long stem	
	External	Internal	External	Internal	External	Internal	External	Internal
Botryodiplodia theobromae	7,50	8,75	3,25	5,50	7,75	9,25	2,00	4,00
Colletotrichum gloeosporioides	2,25	3,50	2,00	2,50	4,00	8,75	1,50	3,50
Dothiorella aromatica	2,75	4,50	1,50	2,25	3,25	5,00	2,00	3,25
Drechslera setariae	0,50	0,50	0,00	0,00	0,25	0,25	0,00	0,00
Fusarium decemcellulare	0,75	1,00	0,50	0,50	0,50	0,50	0,00	0,00
Fusarium sambucinum	1,00	1,25	0,00	0,00	1,00	1,25	0,25	0,25
Fusarium solani	0,75	0,75	0,25	0,25	0,00	0,00	0,00	0,00
Pestalotiopsis versicolor	1,00	1,00	0,00	0,00	1,00	1,00	0,00	0,00
Phomopsis perseae	1,25	2,75	0,75	1,25	1,25	2,00	1,00	1,50
Rhizopus stolonifer	3,00	3,00	0,00	0,00	10,00	10,00	0,00	0,00
Thyronectria pseudotrichia	1,50	2,00	0,50	0,75	1,25	1,75	0,25	0,25

TABLE 3B: Pathogenicity of stem-end rot fungi to various avocado cultivars (Hass & Ryan)

Fungi	Average stem-end rot damage (rated from 0—10)							
	Hass				Ryan			
	Stemless fruit		0,5 cm long stem		Stemless fruit		0,5 cm long stem	
	External	Internal	External	Internal	External	Internal	External	Internal
Botryodiplodia theobromae	6,50	10,00	0,00	2,75	9,75	9,75	4,50	5,00
Colletotrichum gloeosporioides	5,75	1,00	1,75	9,25	10,00	10,00	5,75	9,50
Dothiorella aromatica	2,00	9,25	2,00	7,25	10,00	10,00	8,00	8,75
Drechslera setariae	0,00	1,00	0,00	0,50	0,00	0,00	0,00	0,00
Fusarium decemcellulare	0,00	0,50	0,00	1,00	1,25	1,25	0,50	0,50
Fusarium sambucinum	0,00	2,50	0,00	0,00	0,75	1,00	0,00	0,00
Fusarium solani	0,00	0,50	0,00	0,00	0,00	0,00	0,50	0,50
Pestalotiopsis versicolor	0,50	1,75	0,00	0,25	1,00	1,25	1,00	1,00
Phomopsis perseae	0,00	2,00	0,00	1,00	4,50	5,75	1,00	2,00
Rhizopus stolonifer	0,00	0,25	0,00	0,00	3,00	3,25	0,00	0,00
Thyronectria pseudotrichia	0,75	3,50	0,00	1,50	3,50	4,00	1,25	2,00

DISCUSSION

In 1979 the average incidence of the three major post-harvest diseases, stem-end rot, anthracnose and Dothiorella/Colletotrichum fruit rot, was considerably lower than in 1978 (Table 1). This is attributed to a much dryer summer season compared to previous years.

The seasonal distribution of these problems corresponds with earlier observations. Early in the picking season while still wet, a particularly high incidence of stem-end rot and anthracnose was recorded. The deleterious effect of rain was clearly demonstrated even towards the end of the picking season. In general, stem-end rot tended to decrease while anthracnose and Dothiorella/Colletotrichum rot seemed to increase during the picking season.

It is interesting to study the post-harvest diseases on Fuerte fruit which were pre-harvest inoculated with various stem-end rot pathogens (Table 2). Here, only C. gloeosporioides and Dothiorella were found to be capable of directly attacking fruit, both in the form of externally visible fruit spot (or rot) and also stem-end rot. B. theobromae (Diplodia natalensis) caused stem-end rot only, but in a few cases we have recovered the fungus from under the skin of apparently symptomless fruit. F. decemcellulare induced a few small borwn fruit lesions. None of these pathogens caused any disease symptoms on the fruit pre-harvest and the symptoms recorded have all appeared post-harvest on softening fruit. Fruit inoculated with Phomopsis perseae dropped before harvest, so no observations could be made of this organism.

An intensive study on the pathogenicity of these organisms showed that they can cause stem-end rot on some or all four cultivars (Table 3A & 3B). Apart from successful inoculation through the stem attachment of debuttoned fruit, it was found that C. gloeosporioides, D. aromática, B. theobromae, P. perseae and T. pseudotrichia can effectively invade fruit via the stem (0,5 cm long). The other fungi did negligible or no damage at all through the stem. Symptoms are usually more severe internally than externally.

REFERENCES

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