South African Avocado Growers' Association Yearbook 1994. 17:46-48

ISOLATION AND PATHOGENICITY OF AVOCADO POST-HARVEST PATHOGENS FROM WESTFALIA AND OTHER AVOCADO PRODUCING AREAS

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ABSTRACT

A survey of postharvest pathogens occurring on avocado fruit originating from Westfalia, Tzaneen, Mooketsi, Levubu, Louis Trichardt, Rustenburg, Kroondal and Avonridge was carried out at weekly intervals for one month in 1989. In each area, at each sampling date some variation in the isolation rate of the pathogens was noted. Colletotrichum gloeosporioides *(23,9%) and* Dothiorella aromatica *(20,4%) were isolated most frequently.* Lasiodiplodia theobromae *was not isolated from fruit collected in the Tzaneen area. The least frequently occurring fungi included* Thyronectria pseudotrichia *(1,1%),* Trichothecium roseum *(0,1%),* Fusarium solani *(0,1%)* and Drechslera setariae *(0%). In pathogen/city tests Fuerte fruit inoculated with each of the nine isolated pathogens developed lesions varying in size from 11,5 cm^2 for* Pestalotiopsis versicolor *to 83,8 cm^2 for* T. roseum. *Inoculating fruit on the side was more effective than stem-end inoculation for symptom development. Reisolation of all pathogens (except* D. setariae *and* Phomopsis perseae) *from artificial inoculations was significant at the 5% level.*

INTRODUCTION

Fungi associated with pre-and postharvest diseases of avocado fruit at Westfalia Estate were described by Darvas & Kotzé (1987). In a later study, Darvas et al. (1987) established the pathogenicity of fungi causing post-harvest diseases of avocado fruit. According to Bezuidenhout & Kuschke (1983) losses of up to 29% have been reported for anthracnose caused by *Colletotrichum gloeosporioides* Penzig., and 10% for stem-end rot (SE) caused mainly by *C. gloeosporioides* and *Dothiorella aromatica* (Sacc.) Petr. & Syd.

Recently, pathogens other than those described by Darvas & Kotzé (1987), were found to cause stem-end and fruit rot of avocado in New Zealand (Hartill, 1991). In South Africa avocado production spans a wide geographical area and not all areas have been monitored for avocado post-harvest pathogens. The purpose of this paper is to report on a survey of avocado fruit pathogens from Westfalia and seven other avocado producing areas and to evaluate their pathogenicity.

MATERIALS AND METHODS

Isolation of post-harvest pathogens

Ten boxes of Fuerte fruit from each of seven different avocado producing areas in South Africa as well as 50 boxes from Westfalia Estate were collected from the Pretoria fresh fruit market at weekly intervals for one month during the peak avocado season in 1989. All boxes were left to ripen at ambient room temperature in the laboratory after which fungal isolations were made from each symptomatic fruit showing stem-end lesions. To isolate post-harvest pathogens, fruit was surface disinfected by dipping in 75% ethanol and left to air-dry before six 2 mm squares of internally infected tissue were aseptically cut from the fruit using a sterile scalpel. Samples were placed on Potato Dextrose agar (PDA) supplemented with 0,01% chloramphenicol and plates were incubated for 7-14 days at 25°C. Isolates were identified and their identity confirmed by the Mycology Unit, Plant Protection Research Unit, Pretoria.

Evaluation of pathogenicity

All identified isolates listed in Table 1 were evaluated for pathogenicity. Mature, unripe Fuerte fruit obtained from the Pretoria fresh fruit market were surface disinfected by dipping into 75% ethanol for 3 sec. and allowed to air-dry. Fungal discs (5 mm^2) were cut aseptically from the edge of actively-growing cultures and placed into a 5 mm^2 hole made centrally on each of 16 fruit with a sterile corkborer (5 mm diam) after fruit plug was removed. Fruit plugs were replaced, covered with sterile nonabsorbent cotton wool and secured with masking tape. In addition, the pedicel was removed and a fungal disc from each isolate placed into the stem-end opening, before replacing the pedicel and taping it onto the fruit. Fruit was kept at 25°C to ripen for two days after which the cotton wool and tape were removed and fruit was left to ripen a further five days. Lesion area was determined for each pathogen by measuring the length and width in mm of resultant necrotic tissue. Reisolations were made from necrotic lesions and the identity of the isolates confirmed as described above. A log linear model was used to determine the significance of reisolations.

TABLE 1
Percentage isolation of avocado post-harvest pathogens from symptomatic fruit obtained from the Pretoria fresh fruit maret over a period of one month in 1989

Postharvest pathogens	Area in which fruit originated																		Mean isolation rate (%)
	Westfalia		Tzaneen		Mooketsi			Levubu			Louis Trichardt		Rustenburg			Kroondal		Avon-ridge	
	1ª	5ª	4ª	5ª	1ª	2ª	3ª	1ª	2ª	3ª	2ª	5ª	2ª	3ª	4ª	4ª	5ª	4ª	
Colletotrichum gloeosporioides	37,0	21,0	34,0	34,0	61,0	32,0	13,2	7,5	12,0	8,0	40,3	35,0	13,0	7,3	25,5	32,0	19,5	31,7	23,9
Dothiorella aromatica	28,3	26,4	15,5	14,5	0	20,3	21,8	17,5	0	44,1	31,7	0	74,0	16,3	9,9	16,5	20,5	9,1	20,4
Drechslera setariae	0	0	0	0	0	0	0	0	0	0	0,1	0	0	0	0	0	0	0	0
Fusarium solani	1,0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0,1
Lasidioplodia theobromae	17,6	12,0	0	0	21,5	21,5	17,2	2,5	4,0	17,7	4,3	6,2	8,0	15,7	0	28,2	7,1	0	10,3
Pestaliopsis versicolor	2,6	1,7	0	0	3,0	3,0	0	7,5	0	10,2	2,3	4,0	0	30,5	4,0	2,0	13,5	1,0	4,6
Phomopsis perseae	0	2,0	0,5	0	0	0	3,0	0	0	6,3	0	0	0	1,2	0	0	3,7	4,9	1,2
Trichothecium roseum	1,0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0,1
Thyronectria pseudotrichia	0	2,0	0	1,0	1,0	0,8	1,0	0	3,9	0	0,7	3,0	0	1,5	0,2	1,4	1,5	1,2	1,1

Date when fruit were collected from the market: 1 = 12/4/89 ; 2 = 19/4/89 ; 3 = 26/4/89 ; 4 = 3/5/89 ; 5 = 10/5/89

RESULTS

In each area and at each sampling date some variation in the isolation rate of avocado pathogens was noted. The mean isolation rate of *C. gloeosporioides* (23,9%) was the

highest, followed closely by *D. aromatica* (20,4%) and *L theobromae* (Pat.) Griffon & Maubl. (10,3%). *P versicolor* (Speg.) Steyart. (4,6%) and *P. perseae* Zerova (1,2%) were isolated less frequently (Table 1). *L theobromae* was not isolated from fruit collected in the Tzaneen area while the highest isolation rate was that for *D. aromatica,* from fruit collected in the Rustenburg area on the first sampling date. At the second and third sampling dates, a drastic decrease in the isolation rate of the latter pathogen was noted (Table 1). The mean isolation rates of *T. pseudotrichia* (Schw.) Seeler (1,1%), *T. roseum* (Persoon) Link (0,1%), *F. solani* (Mart.) Appel & Wr. emend. Syd & Hans (0,1%) and *D. setariae* (Sawada) Subram. & Jain. (0%) were the lowest.

Pathogenicity of post-harvest pathogens isolated from stem-end lesions was confirmed (Table 2). Fuerte fruit inoculated with each of the nine isolated pathogens developed lesions varying in size from 11,5 cm^2 for *P. versicolor* to 83,8 cm^2 for *T. roseum* after 14 and 12 days respectively. Inoculating fruit on the side was more effective in producing lesions than stem-end inoculation. In general, the pathogens could be reisolated successfully from artificially infected fruit at a 5% level of significance. However, reisolation of *D. setariae* and *P. perseae* was significantly (P = 0,05) less effective. *C. gloeosporioides, D. aromatica* and L *theobromae* took seven days for complete symptom development on the side of the fruit, and *T. pseudotrichia* eight days (Table 2). Lesion development was considerably slower with *P. versicolor, F. solani, T, roseum, D. setariae and P. perseae* (Table 2).

TABLE 2
Evaluation of pathogenicity of avocado post-harvest pathogens by side inoculation of Fuerte fruit.

Pathogens isolated from stem-end rot lesions	Time for symptom development (days)[a]	Percentage reisolation	Level of significance of reisolations[b]	Lesion size[c] after 7 days (cm^2)
Colletotrichum gloeosporioides	7	81,8	0,758	60,8
Dothiorella aromatica	7	81,8	0,758	67,2
Drechslera setariae	13	9,1	-3,450	37,0
Fusarium solani	13	91,6	1,395	31,6
Lasiodiplodia theobromae	7	81,1	1,395	54,8
Pestaliopsis versicolor	14	86,7	1,314	11,5
Phomopsis perseae	13	18,1	-3,548	36,9
Trichothecium roseum	12	66,0	1,538	83,8
Thyronectria pseudotrichia	8	88,2	1,394	31,8

a Mean number of days from inoculation until complete symptom development with no further increase in size.
b Ratio of the log-linear parameter estimates to its standard error indicating the level of significance of reisolation at P = 0,05
c Mean of 16 replicates.

DISCUSSION

Avocado fruit diseases at Westfalia Estate have been fully described by Darvas & Kotzé (1987) and Darvas et al. (1987). This is therefore the first report in which areas other than Westfalia have been studied. The high incidence of *C. gloeosporioides* on fruit from most areas in this study (except Levubu) is in agreement with the report by Darvas & Kotzé (1987). However, contrary to the latter author's findings, results of the present study indicated *D. aromatica* and *L. theobromae* to be the second and third most frequently isolated pathogens. According to Darvas & Kotzé (1987), *D. aromatica occurred* most frequently in stem-end rot lesions on Edranol cultivar fruit and *T.*

pseudotrichia occurred most frequently in stem-end rot lesions on Fuerte. They found *L. theobromae* to be a destructive wound pathogen but that it was isolated at low frequency from fruit maintained in cold storage. In the present study no distinction was made between cultivars, but the isolation frequency of *T. pseudotrichia* was very low. *Colletotrichum acutatum* Simmonds ex Simmonds has previously been described as one of the most important fruit rot pathogens in New Zealand (Hartill, 1991). However, the occurrence of this pathogen in S.A. avocados has not been reported.

As in New Zealand (Hartill, 1991) T. Roseum was occasionally isolated from fruit rots in South Africa. However, contrary to his finding (Hartill, 1991) that it induces a slow spreading rot when inoculated into small surface wounds, it was found to be an aggressive wound pathogen in the present study, producing the largest lesion after 12 days. To reinforce the results obtained in this study follow-up survey of fruit from the above-mentioned areas, as well as fruit from other areas should be undertaken.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge financial support from SAAGA.

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