

BACTERIAL CANKER OF AVOCADO

PROGRESS REPORT



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OPSOMMING

'n Virulente bakteriese isolaat geassosieerd met kanker op avokado is geïdentifiseer as P syringae (Van Hall). Die isolaat groei tussen 18 °C – 33 °C met optimale ontwikkeling by 25 °C. Die isolaat se termomodingspunt is bepaal en 'n warmwater-proef met Jong avokado-lote is gedoen om 'n effektiewe beheer maatreël daar te stel.

SUMMARY

A virulent bacterial isolate associated with canker on avocado was identified as Pseudomonas syringae (Van Hall). The temperature range, in which the isolate grows, falls between 18 °C- 33 °C with an optimum of 25 °C. The thermal death point of the isolate was determined and a warm water experiment using young avocado shoots to obtain disease control, was carried out.

INTRODUCTION

In 1980, a new disease, presumably of bacterial origin was observed in the north eastern Transvaal (Myburgh — Kotzé, 1982). This disease is characterized by cankerous lesions on the stem and branches. To date, no leaf or fruit symptoms have been observed. This distinguishes the avocado disease from the typical bacterial canker of fruit and nut trees, caused by *P syringae* (Agrios, 1976).

The only other report on a bacterial disease of avocado was from Smith (1926). He indistinctly described the disease as blast, causing a blemish on the fruit of the Guatemalan type avocado. According to Smith, black pit of lemon, blast of avocado and citrus are all caused by the same pathogen viz *P citriputeale* (CO Smith). Schroth, Hildebrand and Starr (1981) regarded *P syringae* to be the correct name for the blast organism. Twig inoculations with this organism resulted in browning of the vascular system which spread a short distance from the inoculation point (Smith & Fawcett, 1930).

Various bacteria have previously been isolated from cankerous lesions and preliminary experiments determining their pathogenicity have been performed (Myburgh & Kotzé, 1982). A *P syringae* isolated from a cankerous lesion proved to be virulent. Further studies involving tissue culture, Hass seedling inoculations and tobacco hypersensitivity tests will be performed to determine the virulence of the isolates.

MATERIALS AND METHODS

The virulent organism was identified and classified according to Sergey's Manual of Determinative Bacteriology (1974).

The temperature-growth relations were determined by growing the bacteria in a temperature gradient incubator (Thermocon Scientific industries INC) using the method described by Du Preez (1980). The temperature ranged between 8 °C and 42 °C. Growth was followed by measuring the turbidity of the culture in a Bausch & Lomb Spectronic 20 colorimeter as ca 560 nm. Readings were taken at various times after the inoculation viz t₁ = 6h, t₂ = 8h, t₃ = 10,5h, t₄ = 15,5h and t₅ = 24h. The growth rate was determined thus: Absorbance = 2 Log Transmittance.

The thermal death point was determined using a temperature gradient incubator with the temperature ranging from 30 °C to 60 °C. The dilution tube count method of Harricon & McCance (1966) was used to determine the viability of the organism after 5, 15, 60 and 120 min.

A warm water treatment experiment using five 20 cm long Hass cultivar shoots per batch at temperatures of 30 °, 40 °, 45 °, 50 °, 55 ° and 60 °C for 1, 5, 10 and 15 min was performed. After treatment various batches were placed in plastic bags under greenhouse conditions at 25 °C. After three days the viability of the shoots were inspected and the results were plotted on a graph.

RESULTS AND DISCUSSIONS

The virulent isolate was identified as *P syringae* (Van Hall). Judging by the tests done thus far, this strain does not appear to correspond to any of the recognized pathovars.

Results obtained from the temperature-growth relations study were plotted against temperature, at the various times (Fig 1). Growth occurred between 18 ° 33 °C with a optimum of 25 °C. The results obtained could possibly explain why avocado and tobacco inoculations in the greenhouse were unsuccessful. Temperatures in the greenhouse fluctuated between 18 ° and 42 °C, thus complicating disease expression. To date Koch's postulates have not been entirely fulfilled because the typical field symptoms did not develop fully under greenhouse conditions, due to a lack of time

allowed for disease expressions.

Results from the thermal-death point experiment showed a loss of cell viability at temperatures of 42 °C and higher for 5 min, 41 °C and higher for 15 min and 40 °C and higher for 60 min (Fig 2).

Heat treated twigs showed a loss of viability at temperatures of 60 °C and higher (Fig 3). The theoretical boundaries where bacteria associated with the canker can be eliminated from avocado cuttings are presented in Fig 4. A more practical experiment using inoculated shoots, will have to be done.

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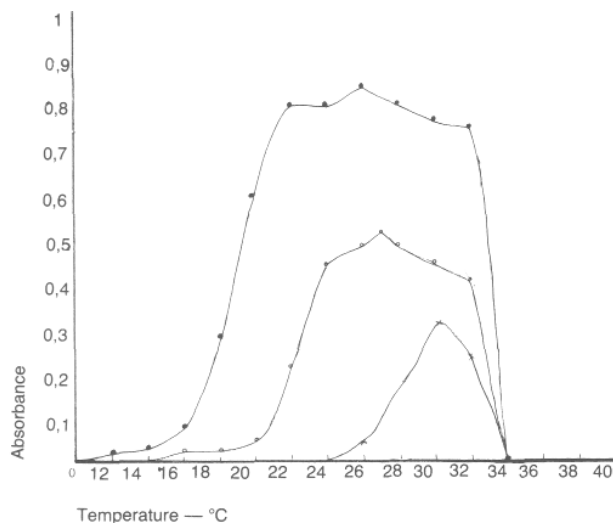


FIG 1. Temperature-growth relations of the avocado canker isolate of *P. syringae*.

- t5 = 24h
- t4 = 15,5h
- x t3 = 10,5h

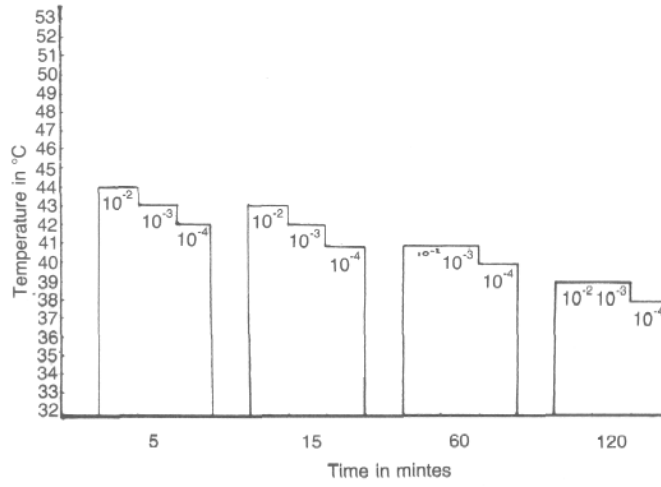


FIG 2. Thermal death points of *P. syringae*.

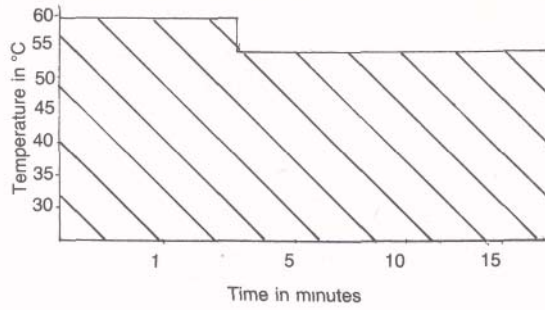


FIG 3. Effect of heat treatments on the viability of avocado shoots.

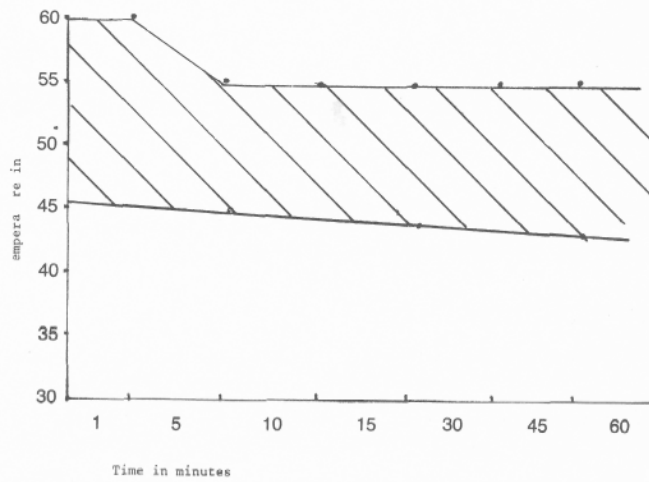


FIG 4. Theoretical temperature boundaries where *P. syringae* can be eliminated, from avocado cuttings. The coloured area represents the difference between plant viability and bacterial cell death.