

# Leaf spot of strawberry caused by *Neopestalotiopsis* sp.

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The extended period of rainfall at the start of Queensland's winter production presented many disease challenges for strawberry producers. Several pathogens were identified, including a higher-than-normal recovery of the fungal pathogen *Neopestalotiopsis* sp.

This article is a follow up from the webinar held in early June 2022 hosted by Berries Australia about the pathogen and was presented by DAF, in conjunction with Dr. Natalia Peres from the University of Florida.

## Is it a new pathogen?

A number of articles have reported *Neopestalotiopsis* sp. as an emerging pathogen causing significant production losses, particularly in the USA. In Queensland, *Neopestalotiopsis* sp. is not a new pathogen. The pathogen has previously been regarded as a secondary invader, typically associated with other known strawberry pathogens such as *Colletotrichum* sp., *Macrophomina* sp. etc. and/or with plants undergoing stress. The pathogen has not caused any significant problems hence it was never a major concern.

## What are the symptoms?

*Neopestalotiopsis* sp. can affect most parts of the strawberry plant. Early infections may manifest on the leaves as small, brown circular spots and further develops into larger, irregular-shaped necrotic lesions often joining with other leaf spots, which then results in the death of the leaf (Figure 1).

Signs of fungal spores may develop on the surface of the leaf. Based on reports overseas, plants may suffer poor establishment, stunting and dieback, and the fruit

starting with small tan lesions and subsequently covered by dark fungal spores. Bear in mind, symptoms caused by *Neopestalotiopsis* sp. may be caused by other common pathogens, such as *Colletotrichum* sp., *Phytophthora* sp., *Gnomoniopsis* sp., hence, accurate diagnosis is important to ensure correct management practices are applied.

## What conditions favour disease development?

Studies in the University of Florida (UFla) found that *Neopestalotiopsis* is favoured by warm and humid conditions, and about 20°C is the optimal temperature, although the pathogen can manifest within a wide temperature range. According to Dr. Peres, it is leaf wetness (water on the surface of the leaves), rather than temperature, that plays a critical role in the infection and development of disease. The pathogen can be spread in the field by wind, water (overhead irrigation and rain), farm equipment, and field workers during harvesting and other farm operations

## Is the pathogen found in other hosts?

Based on several studies, *Neopestalotiopsis* sp. appears to have a wide host range, including apples, avocado, blueberry, macadamia, mango, etc. and in many weeds. It has also been reported commonly occurring in soil, leaf litter and bark of trees.



**Figure 1. *Neopestalotiopsis* sp. symptoms on strawberry.** Photo credit: Apollo Gomez, QDAF

A recent study in Brazil found the pathogen in unwounded eucalyptus leaves. Laboratory isolations from eucalyptus leaves collected in the vicinity of cultivated strawberry plants growing in the Sunshine Coast in June 2022 concurred with the study, suggesting that eucalyptus may be a potential source of the pathogen (Figure 2). However, it is not known if this isolate is the same as the isolates found on strawberry plants.

### Do our current fungicides work?

Fungicide efficacy studies by researchers at UFLA on management of *Neopestalotiopsis* sp. found active ingredients thiram, captan and cyprodinil + fludioxonil reduced incidence of the pathogen. These fungicides are currently registered in Australia for strawberry. A small assay was conducted at DAF Nambour to investigate effectiveness of thiram and cyprodinil + fludioxonil. Infected leaves (cv. Parisienne Kiss) were sprayed till the point of run-off and allowed to air-dry in the laminar flow cabinet for two hours. A small leaf tissue with disease was isolated on potato dextrose agar (PDA) and stored in an incubator. Untreated leaves were also isolated as controls. Four days after treatment, the pathogen was recovered from all the untreated controls. Leaf tissues treated with thiram and cyprodinil + fludioxonil had less recovery of the pathogen and/or reduced growth development on PDA compared with isolates that grew from the untreated control.

However, it did not eradicate the fungus. Although considerations must be taken given the leaves were only given one spray of each fungicide and sampling in this instance, was destructive. In standard commercial practice, if conditions allowed, regular application of crop protectant products would occur and may possibly provide better management of the pathogen.

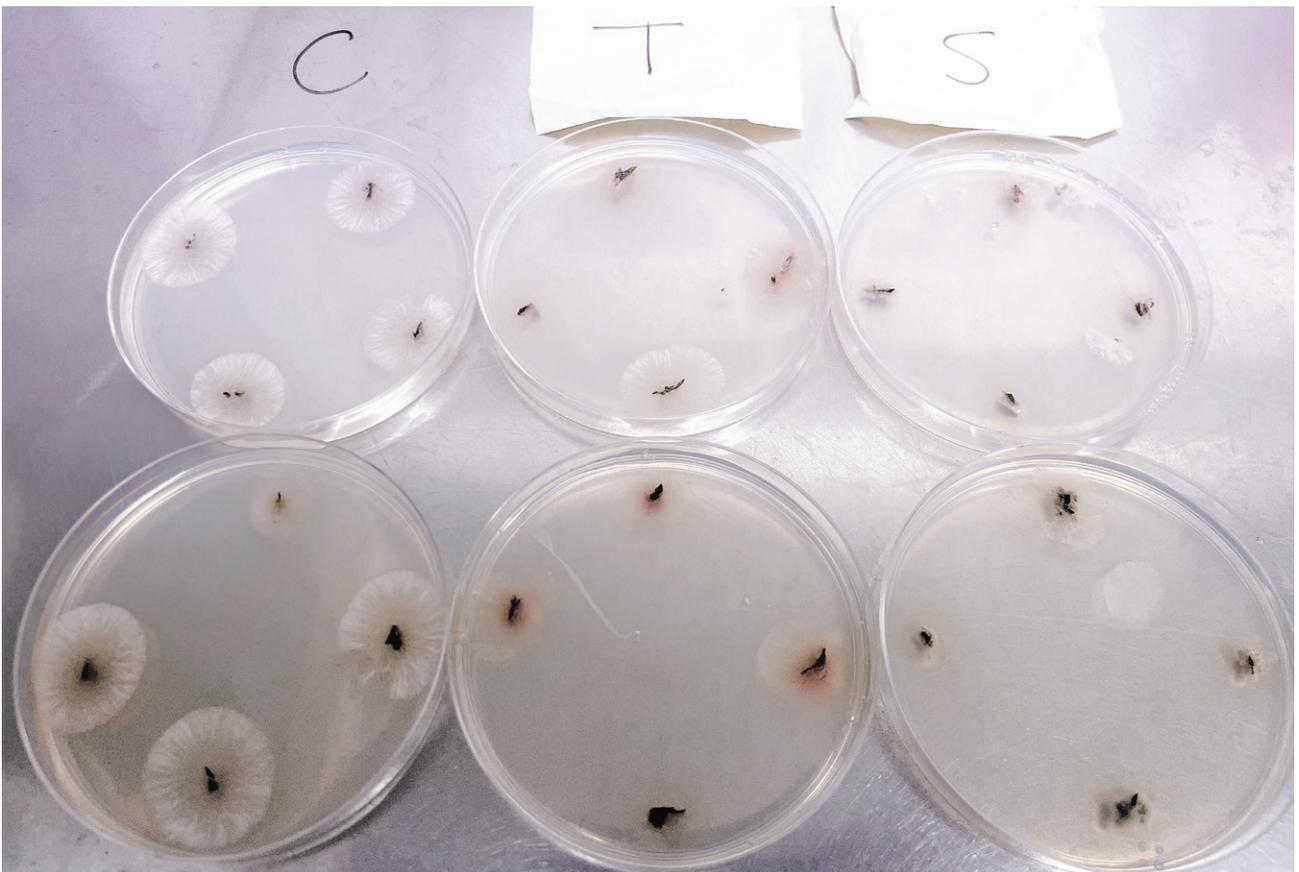
### Will hygiene reduce disease inoculum?

Hygiene is an important part of any agri-production business. Maintaining on-farm hygiene practices regularly will aid in reducing inoculum sources, potential disease transmission and will optimise the farm's ability to manage diseases. In a recent observation, *Neopestalotiopsis* sp.-infected commercial plants (cv. Parisienne Kiss) in Donnybrook, QLD, were 'cleaned-up' in late June, i.e., as many of the infected leaves were removed. After 3 ½ weeks, the plants appeared to have grown 'as per normal' with flowers and fruit present, and with little to no symptoms. There were also no new plant deaths (Figure 4).

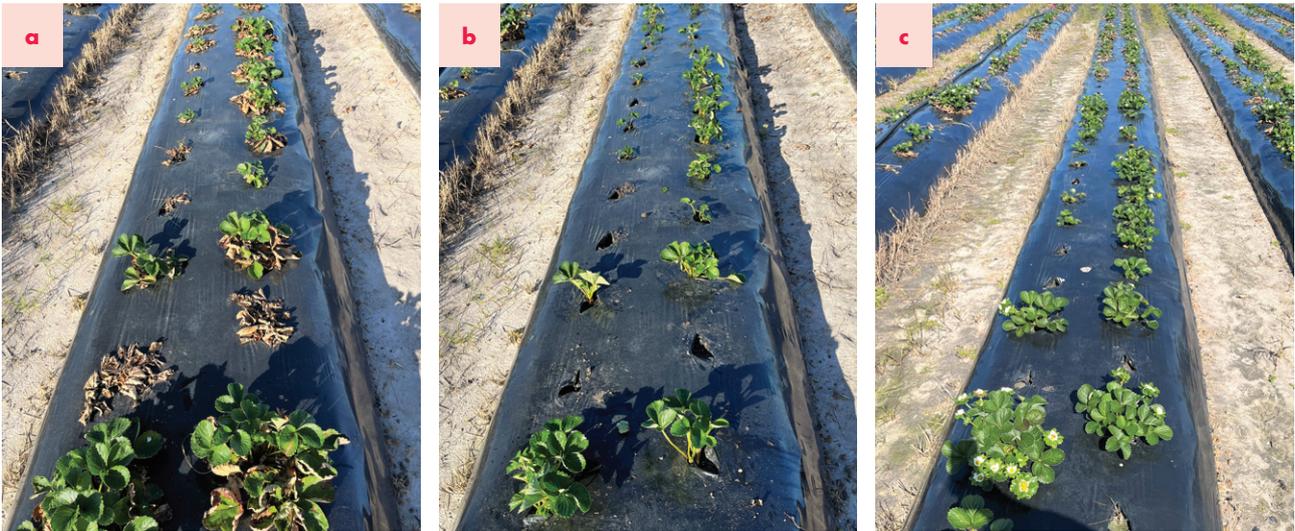
A couple of factors to consider in this instance; the weather conditions during the period of observation were fine and dry with very little rainfall, which may not have favoured disease development, and there were no crop protectant products and fertilisers applied to the plants.



**Figure 2. Eucalyptus leaves within commercial strawberry plants. Subsequent laboratory diagnosis was able to recover *Neopestalotiopsis* sp., suggesting it may be a potential source of the pathogen.** Photo credit: Apollo Gomez, QDAF



**Figure 3. Growth of *Neopestalotiopsis* sp. on PDA after one spray of thiram and cyprodinil + fludioxonil four days after treatment, C = untreated control, T = thiram, S = cyprodinil + fludioxonil .** Photo credit: Apollo Gomez, QDAF



**Figure 4.(a) 21 June pre-removal of diseased material, (b) 21 June, post-removal, (c) 15 July inspection.**

Photo credit: Apollo Gomez, QDAF

### Take Home Messages

- *Neopestalotiopsis* sp. is not a new pathogen of strawberry (in Queensland)
- Extended periods of rainfall from the start of the production season have exacerbated several fungal infections, including *Neopestalotiopsis* sp.
- Leaf wetness is a major factor in the pathogen's spread and disease severity
- The pathogen has a wide host range and appear to be 'everywhere'
- Thiram and cyprodinil + fludioxonil can reduce disease incidence
- On-farm hygiene will optimise integrated disease management
- The incidence of *Neopestalotiopsis* sp. in QLD's winter production has decreased significantly since early June, and this may be attributed to the little to no rainfall experienced in the June–July period
- If you do suspect *Neopestalotiopsis* sp., submit a sample for diagnosis to confirm the causal organism
- Limit farm operations and working with the plants when they are wet to avoid spread of the fungus
- As fungus may persist, encourage field staff to work in 'clean' blocks first and finish in the 'less clean' blocks
- Wash clothes and come in clean the next day

Although the incidence of *Neopestalotiopsis* sp. has significantly reduced since, there is a forecast of the La Niña weather pattern to continue, which may produce the same (or if not, worse) outcome we observed. If conditions do favour the pathogen next season or other leaf diseases, growers should have a fungicide program ready and apply early if necessary.

Further study is warranted to extend on the initial observations presented in this article to better understand the biology of the pathogen and its management in strawberry production in Australia.

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