Serious Citrus Dieback in Colombia Caused by *Ceratocystis fimbriata*

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A new citrus disease in Colombia: symptoms and characteristics of the cultured fungus.

introduction

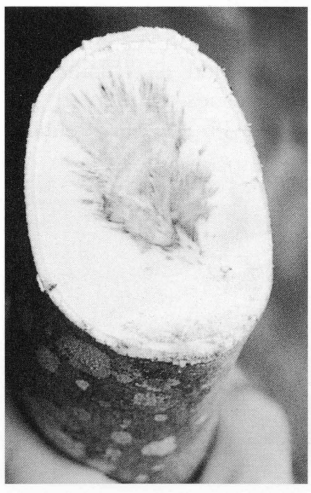
A very worrisome canker disease was recently detected in about 10% of citrus crops in Colombia, but the actual damage toll is probably even higher. Serious dieback has been observed over the last 3-4 years and threatens overall citrus production in the Colombian coffee-growing region. At the joint request of citrus growers in this region (Pereira, Manizales), the Centro nacional de investigaciones de cafe (CENICAFE) and the Instituto colombiano agropecuario (ICA), a task force was sent to assess the causes of this canker disease.

symptoms

The greatest canker damage was noted on cv Tahiti lime (Photo 1) and orange trees (Photo 2). The initial symptoms appear on certain vegetative organs or the whole tree; the leaves yellow and dry up to various extents. The symptoms are similar to those noted during *Phytophthora* attacks.

Photo 1 and 2
Internal damage observed in parts of a citrus trunk or main branches.

1



2

This disease features internal spread of different colours of rot in parts of the trunk or main branches or throughout most of the ligneous tissues of the tree. Comparisons with other diseases can thus only be made by analysing trunk or branch cross-sections.

Internal rotting quite often spreads from the base of the trunk (above the graft) to the top of the tree. Lesions are mainly located in the stele; they then spread centrifugally in a black flame shape (especially in lime, Photo 1), or much more extensively with a yellow serrated front.

External lesions are sometimes noted on various parts of the tree. The first disease symptoms (leaf wilt) often correspond to widespread underlying internal cankers.

diagnosis

The fungus was isolated *in vitro* on various media from samples collected at different sites. Almost all cultures were derived from specimens cut from areas around lesions. Three genera of fungi were identified and their proportions evaluated:

– *Ceratocystis* sp. alone, 22% of the samples,
– *Ceratocystis* sp. + *Fusarium* sp., 8%,
– *Fusarium* sp. alone, 40%,
– *Diplodia* sp., 30%.

Morphological analysis of *Ceratocystis* in culture indicated that it belonged to *C. fimbriata*:

a - typical perithecium and ascospore morphology,
b - conidial stage *Chalara* (endospores/endoconidia),
c - many chlamydospores (alieuspores) (Photo 3).

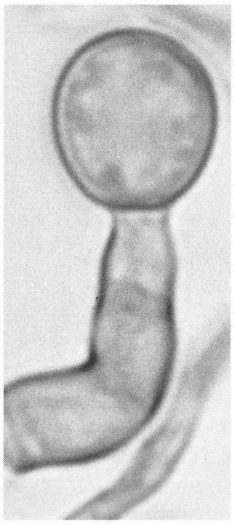


Photo 3
Chlamydospore (alieuspore) observed in Ceratocystis *culture derived from specimens cut from areas around lesions.*

Microscopy analyses of ligneous tissue fragments cut behind the growth front revealed many typical *C. fimbriata* chlamydospores in the pitted vessels. However, very few mycelial or endospore elements were detected.

discussion

The observed symptoms were very reminiscent of those described on plane trees in USA and Europe, and on some fruit trees infested by *Ceratocystis fimbriata* (plum, apricot and peach), especially in California (DEVAY *et al.*, 1968; MOLLER & DEVAY, 1968; MOLLER *et al.*, 1969; BOSTOCK & MIDDLETON, 1987).

In plane trees, the fungus penetrates the host through wounds in its aerial parts. *C. fimbriata* mainly develops in the medullary rays of the infested tree (thus explaining its flame-like appearance) and spreads to the pith. It then spreads in various directions and becomes deeply implanted in the host. The lesions spread rapidly, i.e. from 10 to 100 cm/month. The fungus is transmitted through dispersion of various kinds of debris from infected trees, e.g. sawdust from diseased trees is highly infectious. Fungal inocula are most commonly transmitted on tools used on different trees. Transmission by a few potential insect vectors has also been reported in USA (CRONE & BACHELDER, 1961), but this mode seems to be relatively limited.

In stone fruit trees, *C. fimbriata* is reportedly transmitted from the soil to pruning wounds or other injuries by insects (MOLLER & DEVAY, 1968).

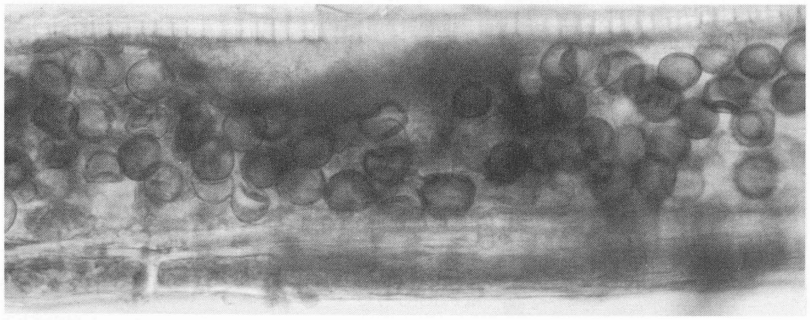
In the Colombian situation, *C. fimbriata* seems to be maintained as chlamydospores in the tree tissues, particularly in the xylem vessels (Photo 4). Identical images in plum trees were published by DEVAY *et al.* (1968).

The problems encountered in isolating this fungus in culture and the low isolation rates as compared to two other genera (*Fusarium* and *Diplodia*), considered to be secondary parasites in this particular situation, could have been due to the fact that *C. fimbriata* was mainly present as chlamydospores in the ligneous tissues.

conclusion

This is the first description of these quite unique symptoms in *Citrus* crops. *C. fimbriata* seems to be the causal agent of this new disease. The present results should now be confirmed by pathogenic analysis of *C. fimbriata* in *Citrus*, e.g. after experimental inoculation. Studies aimed at stalling the progress of this new parasitic threat are under way to further determine some epidemiological components of the disease (etiology and propagation).

Photo 4
C. fimbriata *chlamydospores observed in the xylem vessels of tree tissues.*



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