

Tracheomycosis (*Gibberella xylarioides*) on coffee (*Coffea arabica*)

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Abstract

Tracheomycosis is a typical vascular disease syndrome of coffee incited by a fungal pathogen, *Gibberella xylarioides* (*Fusarium xylarioides*). The fungus was earlier reported to be a well-known pathogen of other *Coffea* species in West and Central Africa in the 1950s. The disease was observed again in Zaire (Congo) in the early 1980s and noticed for the first time in Uganda in 1993, it is now causing economic losses on Robusta coffee in both countries. In Ethiopia, the occurrence of *Gibberella xylarioides* on *C. arabica* was established in the early 1970s. More recently, systematic surveys of tracheomycosis were conducted in coffee fields with known wilt disease history in some localities of southwestern Ethiopia. All coffee trees in each sample field were diagnosed for external and internal symptoms, and the fungal fruiting bodies were also examined. The assessment was accompanied by sample collection for isolation and identification of the causative agents in the laboratory. The most typical characteristic symptom of infection on mature trees and young coffee seedlings is partial (unilateral) wilting. Internally, dark reddish (brown) discoloration is commonly exhibited on the wood after gently scratching the bark of diseased plant. The mean disease incidence ranged from 45 % at Gera to 69 % at Bebeke, with certain variations between coffee fields at each locality. The fungus was identified from most of the sample components, and a large number of sexual and asexual spores were also observed from fruiting bodies collected in the field. This survey along with the earlier works implicated that tracheomycosis develops to an important disease on Arabica coffee, too. One of the speculations for the cause of its reemergence in Congo is that aggressive strains of the pathogen may have arisen. In this case, there was no wilt disease on some Robust coffee in Ethiopia, conversely Arabic coffee has not been affected in Congo and Uganda during the recent outbreaks. Thus further collaborative investigations are being underway in order to contain and manage the disease. These are comparison of *Gibberella xylarioides* isolates from Arabica and Robusta coffees, including earlier isolates in the 1970s; using morphological, genetical and molecular markers; accompanied by proving host specialization of the pathogen on both *Coffea* spp.

Introduction

Tracheomycosis is a typical vascular disease syndrome of coffee incited by a fungal pathogen, *Gibberella xylarioides* (*Fusarium xylarioides*). The fungus was earlier reported to be a well-known pathogen of other *Coffea* species in West and Central Africa in the 1950s (Booth 1971, Coste 1992). The disease was observed again in Zaire (Congo) in the early 1980s and noticed for the first time in Uganda in 1993, it is now causing economic losses to Robusta coffee in both countries (Flood 1996, 1997; Lukwago and Birikunzira 1997). In Ethiopia, the occurrence of *Gibberella xylarioides* on *C. arabica* was established in the early 1970s by Kranz and Mogk (1973). Since then survey works have demonstrated that the disease is becoming the main factor of coffee tree death in the

country (Van der Graaff and Pieters 1978, Girma et al. 2001). In this paper the incidence and some symptoms of the disease on Arabica coffee in Ethiopia was discussed.

Materials and methods

The survey of coffee wilt disease was conducted in 4 localities, Bebekka and Teppi coffee farms, Jimma and Gera Research Centers in the south-western coffee producing regions of Ethiopia in 1996/97. In each locality, three coffee fields, with a consistent and severe coffee tree death history were randomly selected. All diseased (dying and dead) coffee trees in each sample field were diagnosed. The progressive external symptom development along with internal discoloration on the wood was observed and described. At the same time, the presence and/or absence of the fungal fruiting bodies were examined visually or using a magnifying hand lens. Based on the external and internal symptoms, infected coffee trees by *G. xylarioides* were identified and recorded in the field, and disease incidence (percent tree death/plot) was computed. The assessment was accompanied by sample collection for isolation and identification of the causative agent in the laboratory.

Results and Discussion

Affected coffee trees with *G. xylarioides* usually occur singly or in group randomly in the fields showing characteristic symptom of wilt disease. The early symptom of infection on mature and young coffee trees are epinasty of leaves on some branches in the lower tree canopy. These leaves first appear chlorotic or necrotic that turn brownish or dark brownish within two or more weeks, and finally drop-off from the branches. These external symptoms most frequently begin on one side of a single stemmed plant or on one of many verticals originated from a tree or on one of the multiple stemmed coffee bush (partial wilting) (Fig. 1a & 1b); and then gradually progress upwards throughout the plant (completely wilted tree). Later in the season, completely wilted trees become dried and stand barely with leafless branches (dead trees). Internally, dark reddish (brown) discoloration is exhibited on the wood of infected coffee plant (Fig. 2). Fruiting bodies (stromata) of the pathogen can be observed in barks of stems and branches of dead coffee trees, from which a large number of sexual and asexual spores were obtained in the laboratory. The fungus was isolated and identified from most of the samples collected from the field. Besides,

The actual mean disease incidence ranged from 45.0 % Gera to 69.0 % at Bebekka, with certain variations between coffee fields at each locality (Fig. 3). These variations may be ascribed to susceptibility of coffee cultivars, intensity of cultural practices and environmental condition.

Conclusion

In conclusion this survey along with the earlier works implicated that tracheomycosis develops to an important disease on Arabica coffee, too (Girma et al. 2001). The disease symptom on young and mature Arabica coffee trees, which is similar to most symptoms of vascular wilt diseases, was consistent with *G. xylarioides* infection. The characteristic partially wilting symptom accompanied by discolored internal tissues would effectively facilitate diagnosis and recognition of infected coffee trees in the field. One of the speculations for the cause of its reemergence in Congo is that aggressive strains of the pathogen may have arisen. In this case, there was no wilt disease on some Robust coffee in Ethiopia, conversely Arabica coffee has not been affected in Congo and Uganda during the recent outbreaks (Flood 1997, Grim and Hinder 2001). Thus further collaborative investigations are being underway in order to contain and manage the disease. These are

comparison of *G. xylarioides* isolates from Arabica and Robusta coffees, including earlier isolates in the 1970s; using morphological, genetical and molecular markers; accompanied by proving host specialization of the pathogen on both *Coffea* spp.



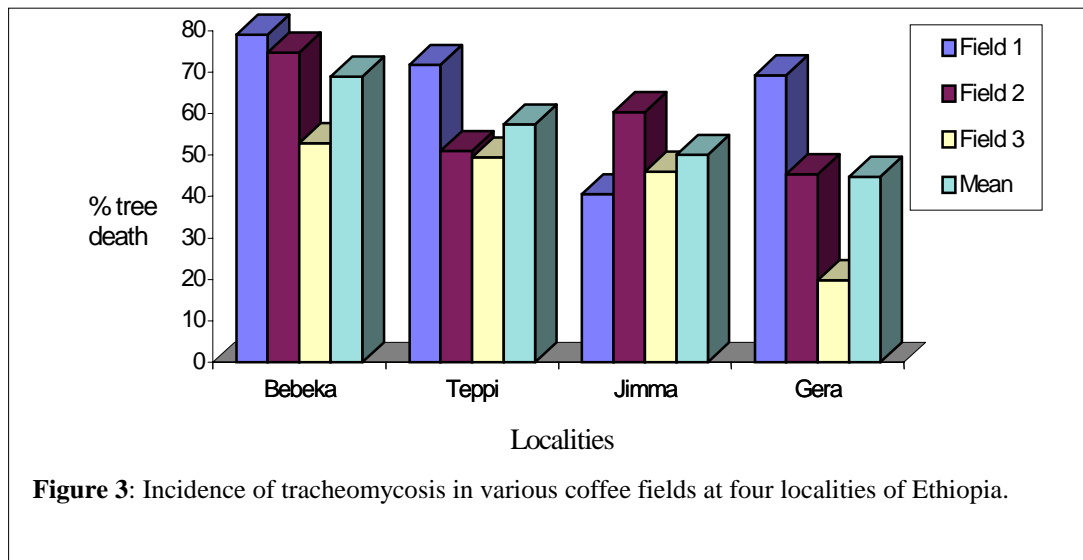
Figure 1a: Partially wilting symptom of tracheomycosis in the field.



Figure 1b: Symptoms of tracheomycosis on seedlings of Arabica coffee after inoculation with *G. xylarioides*.



Figure 2: Typical internal discoloration on infected Arabica coffee wood after gently scratching the bark.



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