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The Occurrence of Leaf Rust Disease of Mulberry Plant (*Morus alba*) in Lowland Humid Forest of Southwestern Nigeria

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Abstract: The etiology and epidemiology of leaf rust of mulberry plant (*Morus alba*) was investigated at Ibadan, South-western Nigeria in the lowland humid tropics. *Cerotilium fici* was associated with the leaf blight and seedlings blight mulberry. Field symptoms of the disease are common both in the dry and wet season beginning with numerous pin-head sized circular brownish to black eruptive lesions on the surface of the leaves. Affected leaves become yellowish and wither as the disease becomes severe. Matured leaves are more susceptible to the disease. The pathogen was also harbored by *Centrosema pubescens* Benth and *Chromoleana odorantum* Linn found growing within the mulberry plots.

Key words: Leaf rust, *Morus alba*, *Centro sema pubescens*, *Chromoleana odorarantum*

INTRODUCTION

Mulberry plant (*Morus alba*) is a widespread and important crop mostly grown for silkworm feed, fruit and timber as well as being an excellent amenity tree. Mulberry is palatable to all classes of herbivorous livestock and is well suited to such small animals as rabbits and caviies^[1]. Its leaves and young bark are recognized as excellent animal feed and are used as a by-product^[2]. Mulberry fruit can be eaten fresh, preserved, vinified or, in some semi-arid areas, dried for winter use. Medicinally, fruits are laxative, refrigerant in fevers and used locally as remedy for sore throat, dyspepsia and melancholia^[3]. The fruit juice is used in folk remedies for tumors of the fauces, the latex is used for dermal cream, while the root extract is used for control of high blood pressure and fruit are used for treating depression, high fever and laxative^[3].

Past reports on leaves of mulberry plants for mulberry sericulture technology programme improvement are replete with high potential of mulberry leaves in Nigeria and else where^[2].

However, in the recent studies in parts of the world and South-western Nigeria, the reported potential of mulberry plant has not been fulfilled because of disease problems^[2].

Leaf rust diseases of mulberry plant seemed to be one of the most commonly encountered foliar fungi diseases of mulberry^[4,5]. The rust is responsible for leaf distortion and mosaic in mulberry plant, symptoms of which include

a numerous pin-head sized circular to oval brownish to black eruptive spots on the surface of the leaves^[6]. Leaves wither off prematurely, as the disease becomes more severe. Leaf rust was observed both in the field and occasionally at nurseries causing not only leaf rusts but also complete withering of sprouting mulberry cuttings.

This study reports an occurrence of the leaf rust disease of mulberry plant at Ibadan in lowland humid tropics.

MATERIALS AND METHODS

Field studies of mulberry plant leaf rust diseases were carried out at the experimental plot located in the Forestry Research Institute of Nigeria, Ibadan. Ibadan (7°20'N, 30°5'E, 200 m above sea level), lies within the lowland humid rain forest zone. The mean annual rainfall of 1150-1500 mm falls mainly between April and October with the major peak in June. Higher relative humidity values (80-95%) are recorded during the rainy season than the dry season (20-50%). The mean maximum and minimum temperatures are 34 and 24°C, respectively.

Leaves and withered seedlings leaves showing rust symptoms were carefully excised from main shoot. The samples were collected by monthly (between November and April 2000-2002) and kept in the sterile sampling bags and were taken to the pathology laboratory for the isolation of the causative organism.

Isolation of the pathogen: The excised mulberry leaves showing symptoms of infections were taken to the Plant Pathology Laboratory of the Forestry Research Institute of Nigeria, Ibadan for the laboratory observation of the causative pathogen. The infected tissues were cut into 2 mm pieces and teased with inoculating pin and stained with lacto-phenol in cotton blue and observation made under binocular microscope. The pathogen was identified by microscopic examination and by comparing with a standard^[6].

Pathogenicity: Ten mulberry plant seedlings were raised in poly-pots and spray inoculated with urediospores suspension (1×10^5 uredospore per mL) of the pathogen. The suspension was prepared by agitating leaf pieces with rust pustles in distilled water and adjusting the concentration according to urediospores counts made with a hemacytometer^[7]. The potted plants were incubated at 22°C under 12 h photoperiods and at 90% relative humidity, after which the plants were then incubated at 25°C at 95% rh under 12 h alternation of light and darkness for 7 days. The disease symptom developments were then monitored. While another set of 2 months old mulberry plant seedlings was also spray inoculated with sterile distilled water. Ten pots per variety replicated 3 times including the control (i.e. the treatment without pathogen) were used for the experiment.

RESULTS

The initial observable symptoms of the disease were pinhead sized circular brownish to black spots on the surface of the affected leaves (Fig. 1B). As the disease advanced the infected leaves becomes yellowish (Fig. 1C)

and as the disease becomes severe, the leaves wither off prematurely.

The initial symptoms in the field, which usually begin in patches, were observed during dry season around November to February. By February over 20% of the leaves of the mulberry were severely infected. Matured leaves are more susceptible to the disease.

The fungus found associated with the leaf rust and leaf withering of the mulberry plant was *Cerotelium fici*. Of all the weeds found growing in the mulberry plots *Centrosema pubescens* Benth. (Fig. 1D and E) and *Chromoleana odorantum* Linn. (Fig. 1F) were found harboring the fungal pathogens. The pathogenicity test revealed that *C. fici* induced rust on the mulberry leaves. The morphological features of the fungal isolates when re-isolated were the same at the initial inoculum. The control plants had no symptoms of infection (Fig. 1A).

DISCUSSION

Leaf rust has been described as one of the most important foliar disease of mulberry plant and as been reported to cause serious damage when leaves are infected^[8]. Withering off of the mulberry leaves prematurely often observed on the sprouted mulberry cuttings and in nurseries was also found associated with *C. fici*. Withering of mulberry leaves caused by *Cerotelium fici* was first reported in India by Ramkrishna in 1952^[9]. Therefore there is the probability of carry over of the pathogen from the field, to the nursery when raising the cuttings as seedlings in the nursery and back to the field when transplanting the seedlings.

The pattern of infections of mulberry leaf rust in the study, namely, the appearance of numerous pin-head

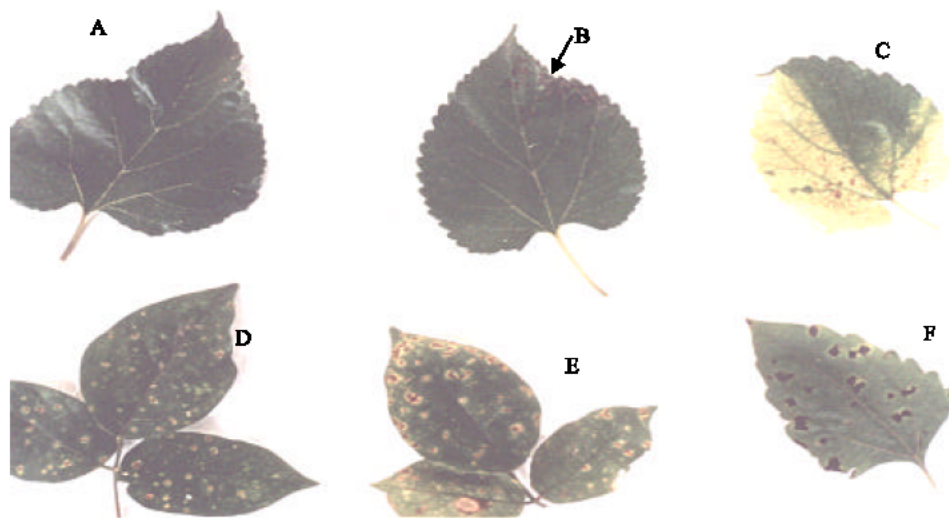


Fig. 1: Symptoms of *Cerotelium fici* on mulberry and weed plants
Morue alba (A) uninfected; (B) black spots; © yellowish symptom)
Centrosema pubescens Benth, (D and E) and *Chromoleana odorantum* Linn (F)

sized circular brownish to black coloured spots on the leaflets which later spread over the entire leaf surface with the affected leaves becoming yellowish and wither off; is similar to the initial symptoms of mulberry blight caused by *C. fici* in India^[6]. Sengupta *et al.*^[6] identified *C. fici* as the fungal pathogen responsible for leaf rust in mulberry plant. *Chromolaena odorata* and which also serve as hosts of *Cerotelium fici* may probably serve as a reservoir for the pathogen. *Cerotelium fici* is known to survive in the absence of the host (mulberry plant) on weed plants. The rapid spread of the disease at the peak of the raining season could be due to the humid condition prevailing at such period which usually supports the germination of urediospores and profuse growth of the fungal hyphae. Similar observation has been reported by Siddaramaiah *et al.*^[9] on leaf rust of mulberry plants in the humid condition. Sukumar and Ramalingam^[10] had also reported that the disease spreads through water droplets and wind currents.

From the foregoing, the severity of leaf rust in mulberry plantation can be reduced through general sanitation and proper plot management, which includes the elimination of susceptible weeds and pruning of, infected shoots within the plot. A wide range of mulberry accession needs to be evaluated to identify those that are resistant or tolerant to leaf rust.

Economic control measures of the disease also needs to be investigated so that acclaimed potential of mulberry in the area can be fully exploited.

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