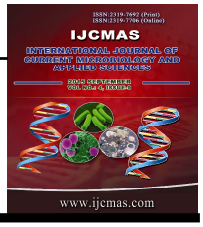
Int.J.Curr.Microbiol.App.Sci (2015) 4(9): 749-754

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 4 Number 9 (2015) pp. 749-754**
http://www.ijcmas.com



Original Research Article

New plant disease record in Panchgaon: Fig rust (*Cerotelium fici* (Castagne) Arthur) on *Ficus benjamina* L.

Narendra Kumar* and S.M.Paul Khurana

Amity Institute of Biotechnology, Amity University Haryana, Manaser-122413, Gurgaon, Haryana (India)
**Corresponding author*

Keywords

Ficus benjamina L., *Cerotelium fici* uredino spores, Rust

A B S T R A C T

Ficus benjamina L.(Weeping fig, also known as the Benjamin's fig, or Ficus) is a genus of flowering_plants of family, Moraceae, planted commonly in gardens in most of the places of Panchgaon.A survey of plants at Panchgaon revealed that this was seriously infected by a rust fungus *Cerotelium fici*, which later leading to drying and death of the foliage.Symptoms initially appear as small, yellow to yellow green spots on leaves as tiny, raised, bright rusty pustules on the adaxial (upper)surface of the leaf thus reducing the available photosynthetic area of the leaf. The spots enlarge and develop a brownish tinge. The diameter of most of the rust pustules ranged between 4-8 mm.Symptoms were absent in the stem and microscopic studies indicated the presence of *Cerotelium fici* uredinospores, formed from the extending mycelium in a crosswise direction and emerged through ruptured lower epidermis.The spores are single celled and have spiky ornamentations on the cell surface. Both mature and young leaves were found to get equally infected by the pathogen.Severe infection of rust often resulted in chlorosis,necrosis and premature leaf fall. This rust is reported for the first time from Panchgaon ,Gurgaon of Haryana state.

Introduction

Ficus benjamina L. (Moraceae), locally known as weeping fig, is a multipurpose tree grows as a large evergreen shrub, up to 8 m tall, with nearly 10 m wide spreading crown and drooping shoots with young slender twigs, with gracefully drooping branchlets and glossy leaves 6–13 cm (2–5 in), oval with anacuminate tip. In its native range, its small fruit are favored by some birds, such as the superb fruit dove, wompoo fruit dove, pink-spotted fruit dove, ornate fruit dove, orange-bellied_fruit_dove, Torresian imperial pigeon, purple-tailed_imperial_pigeon (Frith *et al.* 1976).The tree is known as "Walu nuga" in Sri Lanka.

Ficus trees can maintain their tree-like shape regardless of their size, so this makes them ideal for bonsais or for massive houseplants in large spaces. Their leaves can be either

dark green or variegated. The plant is well known due to its medicinal potential. Its latex and some fruit extracts are used by indigenous communities to treat skin disorders, inflammation, piles, vomiting, leprosy, malaria, nose-diseases and cancer besides the use as a general tonic. *Ficus benjamina* has been shown to effectively remove gaseous formaldehyde from indoor air Kwang *et al*(2008).

Eric Mckenzie (1986) reported fig rust-*Cerotelium fici* on *Ficus carica* from New Zealand causing premature leaf fall in Auckland. This rust fungus does not have any other known hosts other than ficus. Panchgaon lies in the Gurgaon region of Haryana. It comes in Arawali hills ranges. Due to extensive topographic variations there exists a diversity of plant species. Inspite of being floristically rich, these areas have not been thoroughly surveyed for rust fungi. Since no work has been done regarding rust infection on *Ficus benjamina* plants in Panchgaon, Gurgaon, Therefore a survey for rust infection was conducted at Panchgaon, Gurgaon and infected leaf were brought to the laboratory.

Materials and Methods

Infected and healthy leaves of *Ficus benjamina* were collected from Panchgaon Gurgaon ,Haryana State during March 2014 to March 2015. Infected plant parts were noticed carefully in the field, field notes made regarding their way of infection, nature of colonies, pathogenicity, locality, etc.

Microscopic studies

Leaves with different stages of the disease were examined visually and under microscope and symptoms were recorded. The scrapings were taken from infected areas and observed under the low and high power of microscope. The length and breadth of 100 randomly selected uredinospores were recorded. For examination of the development of the fungus within the leaf tissue, hand sections were taken across diseased sites of the leaves and studied under microscope.

Disease symptoms

The diameter of 400 randomly selected rust pustules, 200 from young leaves and 200 from old leaves of *Ficus benjamina* was measured, using a millimeter scale. The growth stage at which the leaf becomes susceptible to rust infection was also studied on 200 twigs that consisted of right from young buds to mature leaves.

Culture trials

In order to culture this rust PDA Medium was prepared. Freshly collected infected leaves portion was cut into 5mm size and kept for growth of rust fungus.

Pathogenicity

Pathogenicity was tried by spraying uredinospores (prepared by dissolving one 5mm diameter of rust pustule in 100ml double distilled water) on three healthy *Ficus benjamina* plants separately. Plants were kept under regular observation upto 25 days.

Results and Discussion

A survey of Plantations of *Ficus benjamina* done at various places of Panchgaon, Gurgaon from March,2014 to March,2015 plants revealed that they were heavily infected with rust. Symptoms initially appear as small, yellow to yellow green spots on leaves as tiny, raised, bright rusty

pustules on the adaxial (upper) surface of the leaf thus reducing the available photosynthetic area of the leaf. The spots enlarge and develop a brownish tinge. The diameter of most of the rust pustules of both young and old leaves ranged between 4-8 mm. Symptoms were not found to be present on the stem. Microscopic studies indicated the presence of *Cerotelium fici* uredinospores, formed from the extending mycelium in a crosswise direction and emerged through ruptured lower epidermis. The spores are single celled, and have spiky ornamentations on the cell surface..Both mature and young leaves were found to get equally infected by the pathogen. Severe infection of rust often resulted in chlorosis, necrosis and premature leaf fall. This rust is reported for the first time from Panchgaon, Gurgaon of Haryana state.

The upper sides of infected leaves showed numerous tiny, raised, bright yellow, powdery rust pustules (uredinia) (Figure 1,2).

It was observed that the pustule did not expand noticeably with the maturity of the leaf, however, when there was severe infection, 1--3 pustules tended to coalesce(Figure 3) and turned into brown, necrotic areas. The pustules found to emerge sparsely on the upper surface of heavily diseased leaves. The twigs were further examined to determine the progression of symptoms during maturation of the leaves. The pathogen however was not seen or recorded on stems.

Spermogonia, aecia and telia not seen. Uredinia hypophyllous, yellowish, minute, covered with ruptured epidermis, pulverulent, scattered over the whole leaf surface, surrounded by numerous incurved paraphyses and turned into brown, necrotic areas. Urediniospores subglobose or ovoid, yellowish brown, 19.5 to 35 × 14 to 22 μm; wall densely echinulate, germ pores 2–4, scattered (Fig.4).The rust was identified as *Cerotelium fici* Cast. This can systematically placed in Basidiomycota: Pucciniomycotina: Pucciniomycetes: Pucciniales: Phakopsoraceae and identified as *Cerotelium fici.*

These morphological characteristics agree with those of *Cerotelium fici* except telia that were not found to be present in these samples (Eric McKenzie,2013).

It can be seen on Fig.5 that the lower epidermis cell has been disintegrated due to the pressure exerted by the growing fungal structure. Premature defoliation was noted to approach about90-100 per cent. Both mature and young leaves were found to be equally susceptible to the pathogen. The apical bud showed absence of *Cerotelium fici* infection.

On microscopic examination abnormally yellow colour of plant tissues was observed resulting from partial failure to develop chlorophyll. Thus leaving large portions of the leaf unable to photosynthesize, reducing the plant's ability to manufacture food (Figure 5). As disease progresses, the spots got enlarged and merged to form sunken brown spots. Lastly infected leaves curled and eventually drop off. There was premature death of cells in living tissue causing necrosis. The overall fungal infection showed the shedding of various parts such as a plant dropping a leaf, fruit, flower, or seed. Thus this rust caused leaf chlorosis, necrosis and premature leaf fall.

The fungus did not grow on PDA medium. Thus fungus is an obligate parasite.

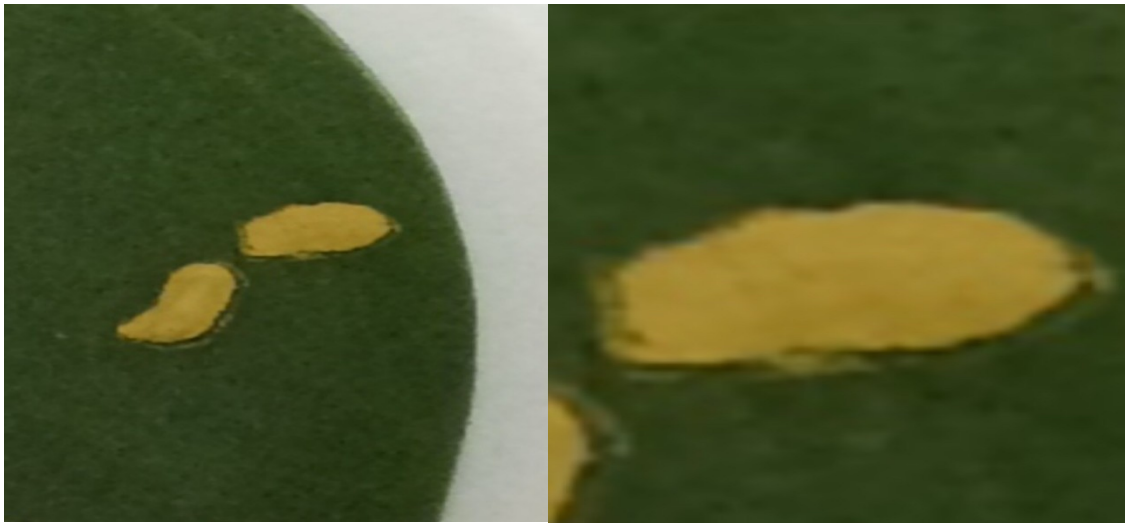
Typical *Cerotelium fici* symptoms got developed in 15 days on all spray inoculated leaves while noninoculated leaves remained

healthy. After 25 days of interval similar uridiniospores development was recorded. Characteristics and spore measurements matched those of the rust from original infected plants.

Fig.1 *Cerotelium fici* infection on leaves of the *Ficus benjamina*

Fig.2 Enlarged view of Rust infection

Fig.3 1--3 pustules tended to coalesce



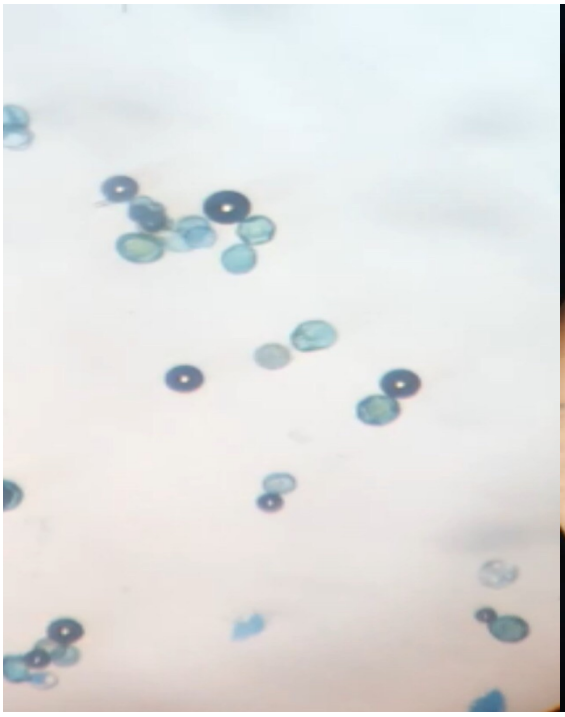


Fig. 4 Scrapped rust Urediniospores

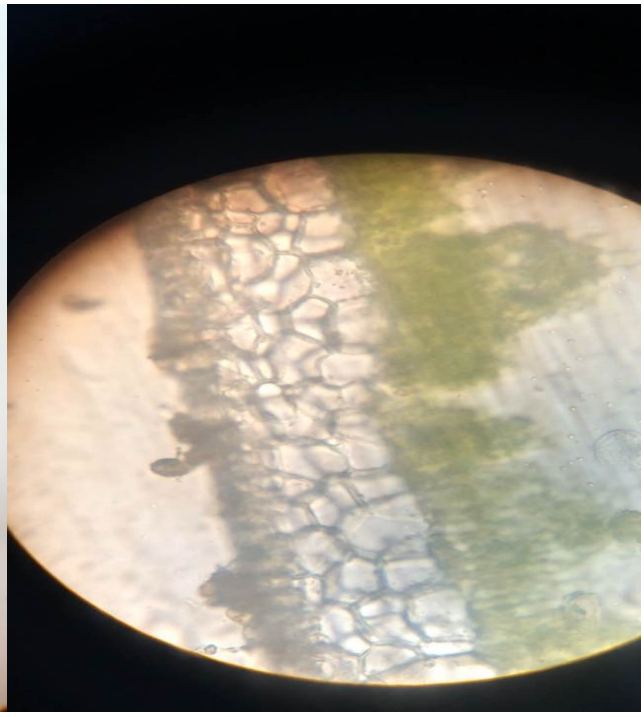


Fig.5 Urediniospores emergence on lower epidermis

Eric Mckenzie (1986) found *Cerotelium fici* (E. Butler) Arthur), in early February 1986 to be causing premature leaf fall of fig trees (Ficus carica L.) in Auckland. Morton (1987) found most prevalent in rainy seasons. But in present investigation the infection was observed in March to May months.This may be due to climatic conditions.Morton (1987)said that leaf rust is caused by *Cerotelium fici*; bringing about premature leaf fall and reducing yields. *Cerotelium fici* has been reported on leaves of *Ficus palmata*, *F. carica* L., *F. religiosa* L. from Lahore, Changa Manga, Sangla Hill, Tandojam, Malir (Karachi) and Rawalpindi by Ahmad (1956a, b), Hasnain *et al*. (1959), Khan and Kamal (1968), Ghaffar and Kafi (1968) and Kaneko (1993). Saba *et al* (2013)reported *Cerotelium fici* infection from Jammu and Kashmir.

During present investigation enough defoliation was observed. However, as for our knowledge this is the first report of this rust fungus from Panchgaon, Gurgaon Haryana.

The rust caused by *Cerotelium fici* in *Ficus benjamina* was at uredinial stage where the fungus produces urediniospores. Urediniospores showed arising from the lower surface of leaves. The other fruiting structures like telium, aecium or spermatium were not found to be present. Both mature and young leaves were found to be equally susceptible to the pathogen. The apical bud showed absence of rust infection. Severe infection of rust often resulted in chlorosis, necrosis and premature leaf fall.

Acknowledgements

Thanks to Director, Amity Institute of Biotechnology, Amity University Haryana for providing necessary Laboratory facilities.

References

Ahmad, S., 1956a. Uredinales of West Pakistan. *Biologia*, 2: 29–101

Ahmad, S., 1956b. *Fungi of Pakistan*, Vol. 1, pp: 1–126. Biological Society of Pakistan, Lahore Monograph.

Eric Mckenzie (1986)New plant disease record in New Zealand: Fig rust (*Cerotelium fici*) on *Ficus carica*. *New_Zealand_Journal_of_Agricultural Research*, 29(4):707-710. DOI: 10.1080/00288233.

Frith, H.J.; Rome, F.H.J.C. & Wolfe, T.O. (1976): Food of fruit-pigeons in New Guinea. *Emu* 76(2): 49-58. HTML abstract

Ghaffar, A. and A. Kafi, 1968. Fungi of Karachi. *Pak. J. Sci*., 20: 5–10

Hasnain, S.Z., A. Khan and A.J. Zaidi, 1959. *Rusts and Smuts of Karachi*, p: 36. Botany Department, Karachi University Mont. 2

Kaneko, S. 1993. Parasitic fungi on woody plants from Pakistan. *Cryptogamic Flora Pak.*, 2: 149–168.

Khan, S.A. and M. Kamal, 1968. The fungi of South West Pakistan. Part 1. *Pak. J. Sci. Ind. Res*., 11: 61−80.

Kwang Jin Kim, Mi Jung Kil, Jeong Seob Song, Eun Ha Yoo, Ki-Cheol Son, Stanley J. Kays (July 2008). "Efficiency of Volatile Formaldehyde Removal by Indoor Plants: Contribution of Aerial Plant Parts versus the Root Zone". *Journal of The American Society for Horticultural Science* 133(4): 521–526. ISSN 0003-1062

Morton, J. 1987. Fig. p. 47–50. In: Fruits of warm climates. Julia F. Morton, Miami, FL.

Saba, M., A.R.K. Niazi and A.N. Khalid, 2013. New records of Uredinales (Basidiomycota) from Azad Jammu and Kashmir and adjacent Northern Areas of Pakistan. *Int. J. Agric. Biol*., 15: 878-884.