

A study on mango (*Mangifera indica* L.) trunk decay by *Phellinus gilvus* (Schw.) Pat. from Himachal Pradesh, India

Ajay Kumar Gautam

Department of Botany, Abhilashi Institute of Life Sciences, Mandi - 175008 (H.P.), India

E-mail address: a2gautam2006@gmail.com

ABSTRACT

A severe white rot decay of a very old mango (*Mangifera indica* L.) tree trunk was observed from Himachal Pradesh, a hilly state of north India. The initial of decaying symptoms were firstly noticed in 2010 which progressed with destructive tissue death of tree trunk. A spongy, sessile, bracket-fungus was found associated with the decay. Morphological and microscopic examination of the collected specimens confirmed the fungus as *Phellinus gilvus* (Schw.) Pat. Since, *P. gilvus* is a saprobic fungus having a wide host range worldwide and *M. indica* is one of the most attacked hosts in India. Therefore, the present report is an important addition to the existing knowledge which will be helpful in understanding the pathogen diversity and interaction with host.

Keywords: *Phellinus gilvus*; Mango; *Mangifera indica*; Himachal Pradesh; India

1. INTRODUCTION

The mango (*Mangifera indica* L.) is an important fruit plant of genus *Mangifera*, distributed in tropical and subtropical regions of the world. Taxonomically, it belongs to a flowering plant family Anacardiaceae and believed to be native of South Asia, from where it has been distributed worldwide and became one of the most cultivated fruits crop in the tropics. The plant is an evergreen tree reaching up to a height of about 15-30 meters with trunk girth 4 meters. The mango fruits are known as king of fruits and cultivated globally for commercial importance. The global mango production is approximately 38.6 million tons; of which India contribute 16.34 million tons and ranks first. It is the national fruit of India as well as the Philippines and the national tree of Bangladesh. The timber of a mature mango tree is used in furniture and wall and floor paneling (Singh, 1960; Kumar et al., 2009; Litz, 2009; Gopalakrishnan, 2013).

A severe decay of a very old mango tree trunk was observed from Himachal Pradesh, a hilly state of north India. The decay process was so rapid that plant trunk has spoiled within few years. Therefore, present study was undertaken with the objective to study the fungi associated with mango trunk wood decay.

2. MATERIALS AND METHODS

The decayed wood was collected from infected trunk of mango tree located at Berthin, District Bilaspur, Himachal Pradesh, India. The wood samples were examined morphologically and microscopically in the laboratory. The physical texture of decayed wood was also analysed. Fungal samples were processed for shape, colour and texture of bracket as well as for hyphae, basidia and spores. A voucher specimen has been deposited at Department of Botany, Abhilashi Institute of Life Sciences (AILS), Mandi, Himachal Pradesh, India.

3. RESULTS AND DISCUSSION

The initial of infection was firstly noticed in 2010 which progressed with destructive tissue death of tree trunk. A regular decrease in three trunk girth was observed. The fungal associated with wood decay was observed as spongy, sessile, bracket-like basidiocarps occurred solitary or in overlapping clusters or rows on dead wood from the base as well as the upper parts of the trunk (Figs. 1, 2 and 3). These collected basidiocarps from diseased plant were allowed to dry at 25 ± 3 °C temperature. The basidiospores were collected by gentle scraping of mature fruiting bodies and examined microscopically.

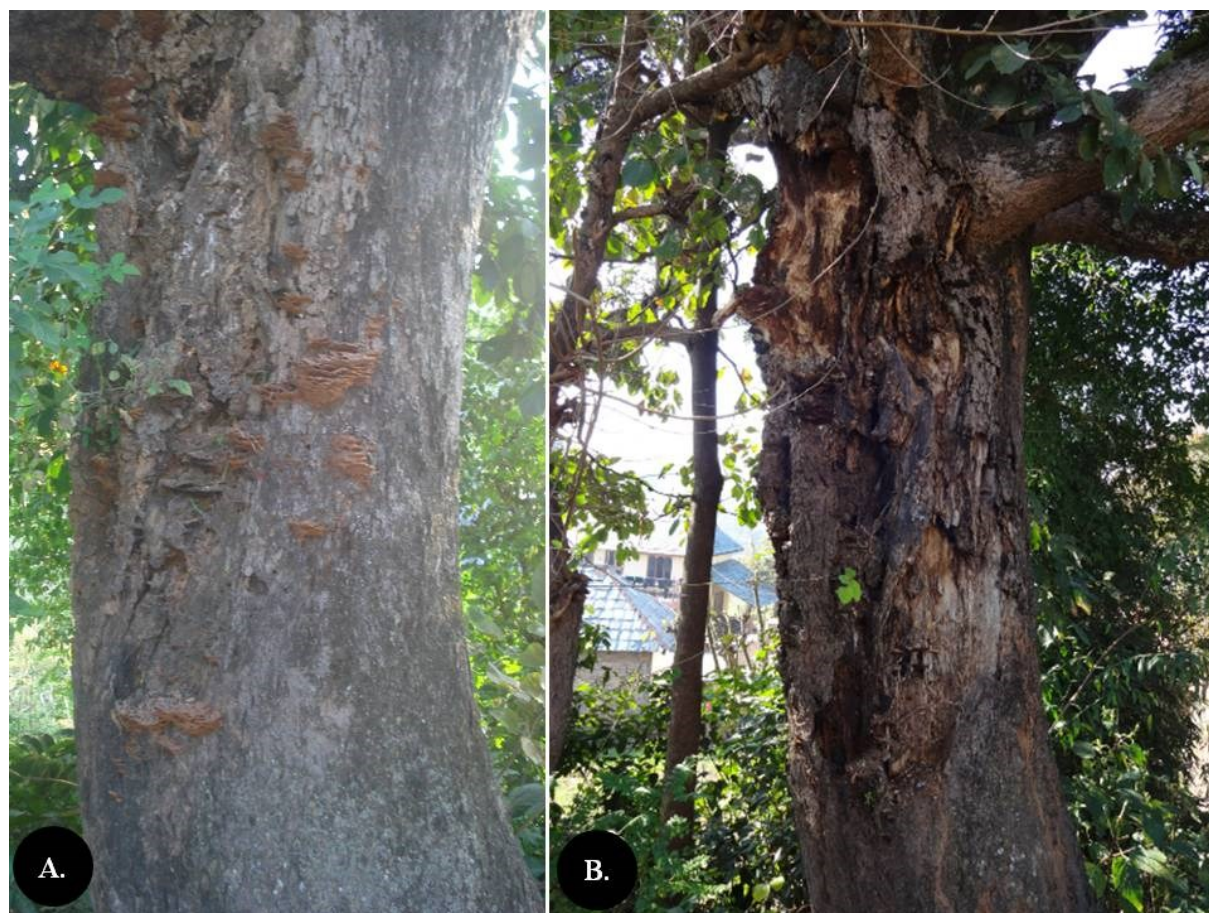


Figure 1. Comparison of decayed mango trunk by *P. gilvus* at; **A)** Initiation of trunk decay, **B)** Wood decay showing soft and spongy wood texture and decreased tree trunk.



Figure 2. Basidiocarp of *P. gilvus* on trunk of *M. Indica* at the initial stage of wood decay.



Figure 3. Wood decay of *M. Indica* trunk showing soft and spongy wood texture.

Taxonomical detail of the pathogen***Phellinus gilvus* (Schw.) Pat. (1900)****Synonymy:** *Polyporus gilvus* (Schw.) Fr.**Common names:** Mustard yellow polypore

Phellinus gilvus is an important saprobic plant pathogen of Basidiomycetes of the phylum Basidiomycota. It belongs to Hymenochaetales order and family Hymenochaetaceae. Morphologically, the upper surface of basidiocarps appeared as bracket shaped rounded structures that were bright rust yellow or reddish brown at first, darker (blackish) with age with margin often yellowish; velvety and rough at first, becoming smoother in age. The pore surface was grayish-brown to reddish or purplish-brown (Fig. 4a & b). The bracket is about 5-13 cm wide and 1.5-2.5 cm thickness. After microscopic examination, the spores were dark brown $2.5-6 \times 2-2.5 \mu\text{m}$, oval to elliptical, hyaline, smooth and. Basidia simple, broadly clavate, four spored, $5-11 \times 5-7 \mu\text{m}$, septate at the base. Hyphae system dimitic; generative hyphae are hyaline, thin-walled, simple septate, $1.5-2.0 \mu\text{m}$ in diameter; skeletal hyphae, thick-walled, simply branched, $2.5-3.5 \mu\text{m}$ in diameter; binding hyphae are also thick-walled, nonseptate, heavily branched, $1.5-2.0 \mu\text{m}$ (Fig. 4c).

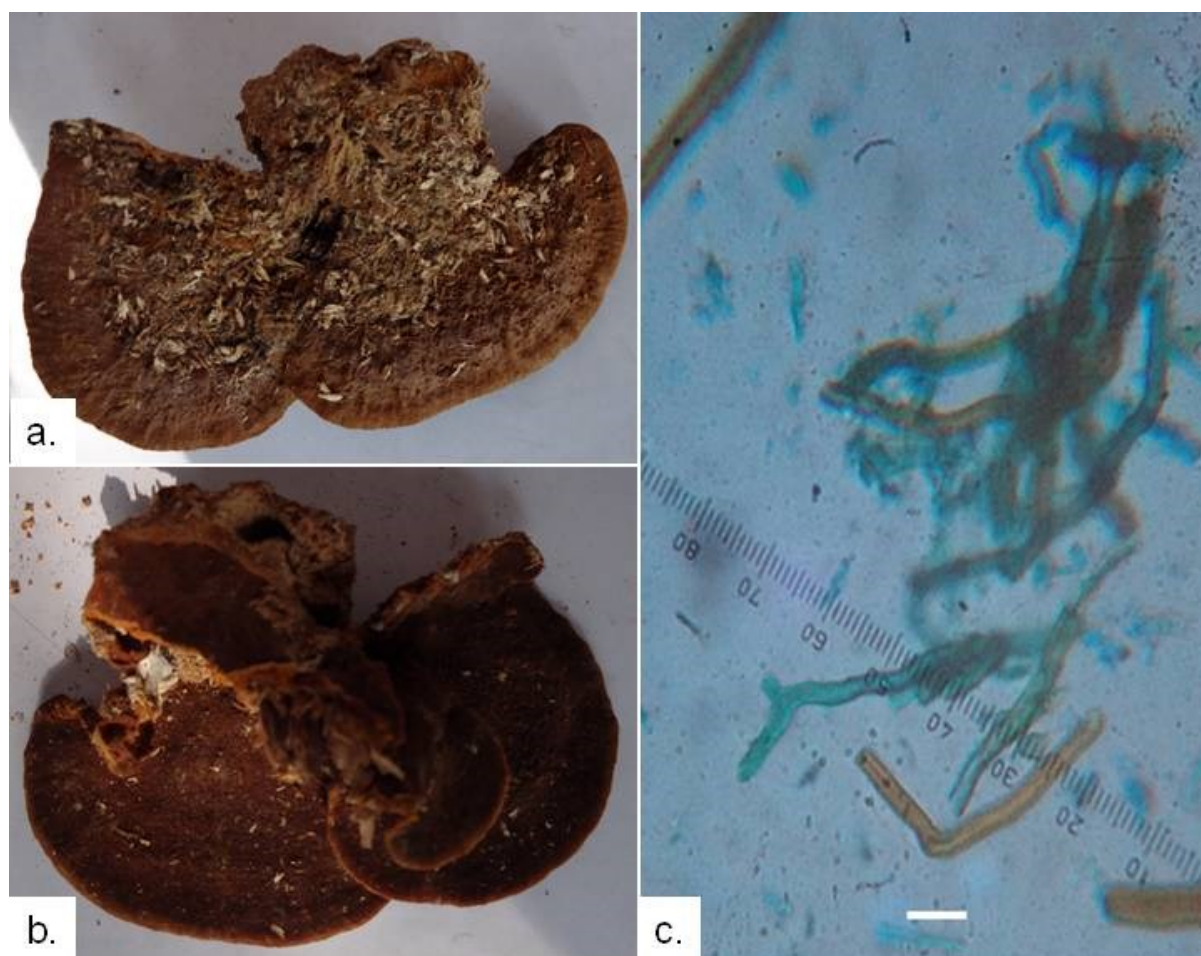


Figure 4. *Phellinus gilvus*. **a.** Basidiocarp (upper surface); **b.** Basidiocarp (lower surface); **c.** generative and skeletal hyphae. Scale = $20 \mu\text{m}$.

The infected wood becomes soft, water soaked and spongy. It generally decays hardwoods; the bark of tree trunk starts peel off after severe infection and inner tissue get exposed. It is interesting to mention here that the pathogen is highly pathogenic, having very strong lignocellulolytic activity; it decay about one fourth of tree trunk in just about three years.

P. gilvus is a plant pathogenic fungus having a wide host range worldwide. The dominant plant genera reported as host are *Quercus*, *Abies*, *Betula*, *Prunus*, *Pinus*, *Salix*, *Acacia*, *Alnus*, *Mangifera*, *Picea*, *Populus*, *Acer*, *Artocarpus*, *Dalbergia*, *Larix*, *Albizia* and *Juglans*. As per a study, it was observed that the most frequently attacked host is *Mangifera* following *Acacia*, *Artocarpus* and *Albizia* India (Bakshi et al., 1957; Wen-Hsiung, 2009; Ranadive et al., 2012). The fungus has the capability to breakdown of wood cell walls leads to the decay. The decay process can also occur in living trees, the pathogen spread much faster and it leads to the death of the trees. It was also studied that the fungus caused losses of starch holocellulose and lignin and the starch grains were degraded (Nagadesi, Arya, 1-3; 2014).

4. CONCLUSION

It is well established fact that mango is the one of the major cash crop (fruit) of India. Although, it earns more than 100 crores (INR) of revenue per year for India, but there is loss of minimum 5-8 mango trees/ acre/year, which causes a great loss to the farmers (Rajput and Rao, 2007). Therefore, the present report on wood decay fungi on *M. indica* form Himachal Pradesh, India is an important addition to the existing knowledge which will be helpful in understanding the pathogen diversity and interaction with host. Further investigations to determine the host range and severity of *P. gilvus* within Himachal Pradesh are required.

ACKNOWLEDGEMENT

Abhilashi Institute of Life Sciences Mandi, Himachal Pradesh, India is gratefully acknowledged for providing necessary infrastructure for carrying out this study successfully.

References

- [1] Bakshi B.K., Arora K.K., Singh S., *Indian Forester* 83(9) (1957) 555-558.
- [2] Ellis M.B., Ellis J.P., *Fungi without gills (Hymenomycetes and Gasteromycetes)*. Chapman and Hall: London, England, 1990, pp. 329.
- [3] Gopalakrishnan S., *World Applied Sciences Journal* 21 (7) (2013) 1000-1007.
- [4] Kumar, B., Mistry, N.C., Singh, B., Gandhi, C.P., *Indian Horticulture Database*, 2008 1st Edn., Ministry of Agriculture, Gurgaon, India, 2009.
- [5] Litz, Richard E., *The Mango: Botany, Production and Uses*. IInd Edn CABI, ISBN 978-1-84593-489-7, (2009).
- [6] Rajput K.S., Rao K.S., *Microbiological Research* 162 (2007) 229-237.

-
- [7] Ranadive K.R., Jagtap N.V., Vaidya J.G., *Elixir Applied Botany* 52 (2012) 11402-11408.
 - [8] Singh L.B., *The Mango: Botany, Production and Uses*. Lenord Hill, Landon (1960).
 - [9] Wen-Hsiung K.O., *Botanical Studies* 50 (2009) 1-10.
 - [10] Praveen Kumar Nagadesi, Arun Arya, *International Letters of Natural Sciences* 1 (2014) 1-7.
 - [11] Praveen Kumar Nagadesi, Arun Arya, *International Letters of Natural Sciences* 2 (2014) 13-22.
 - [12] Praveen Kumar Nagadesi, Arun Arya, *International Letters of Natural Sciences* 3 (2014) 23-29.

(Received 15 February 2014; accepted 20 February 2014)