



First Record of *Ganoderma colossus* Dieback and Wood Decay of *Ziziphus spina-christi*

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ABSTRACT

Ganoderma colossus is the common cause of devastating plant diseases and associated with wood decay and losses in numerous economically important trees. In Oman (2005-2006), this pathogen was detected as a new report on *Delonix regia*, *Ficus altissima*, and *Phoenix dactylifera*. In 2013, the fungus was linked with the dieback of *Sclerocarya birrea*. Recently this fungus was detected on the base of dead *Ziziphus spina-christi* and exhibiting evident growth on the base and the surface of dead logs in Al-Jabal Al-Akhdar in the Western Hajer Mountains, Oman. The fungus was identified using macroscopic and microscopic characteristics. Based on the literature and our knowledge, this is the first record of *G. colossus* causing dieback and wood decay of *Z. spina-christi*.

Key Words: Dieback, *Ganoderma colossus*, Oman, wood decay, *Ziziphus spina-christi*.

INTRODUCTION

Ziziphus spina-christi (L.) Wild (Christ's Thorn Jujbe) also known as "Sedra" in Arabic is an important tropical evergreen species of the family Rhamnaceae found growing massively in arid and semi-arid regions and native to Northern Africa and Western Asia (Bhansali 1975; Mathur and Vyas 1995; Maraghni *et al.* 2010). It is the only tree species considered "holy" in addition to its status as "sacred tree" (Dafni *et al.* 2005). It is one of the common species inhabiting Al-Jabal Al-Akhdar and indigenous to Oman which showed a wide ecological and geographical distribution and growing under variety of environmental conditions and depression in deep sandy soil (Maraghni *et al.* 2010). They are an excellent source of food, fodder and fuel (Mathur and Vyas 1995). The anti-inflammatory analgesic and

antispasmodic properties were approved in rodent animals (Borgi *et al.* 2008; Borgi and Chouchane 2009). During the investigations of the mycoflora of the mountainous areas of Oman, *Ziziphus spina-christi* exhibited evident invasion by devastating fungal growth. The examination confirmed that this fungus is *Ganoderma colossus* which was reported earlier on different plants in Oman (Elshafie *et al.* 2013) and has not been reported before on *Z. spina-christi* trees or dead logs.

MATERIALS AND METHODS

In Al-Jabal Al-Akhdar in the Western Hajer Mountains, Oman, *Z. spina-christi* trees reveal death symptoms and dieback of the branches (Fig. 1) in addition to extensive spongy fungal growth of the base and the surface of the dead logs. The bracket-like basidiocarps which developed on the surface of

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the dead logs measure 15.7-30.4 cm in diameter (Fig. 2), and surrounding the base of the log measuring 64.5-72.4 cm in diameter (Fig. 3) with 3.4 cm thick. The basidiocarps were collected, allowed to dry at ambient temperature (29-35°C), and were then examined and morphologically described. The basidiospores (Fig. 4) were collected from mature fruiting bodies, examined microscopically, identified and the identification was confirmed and compared with the available literature and materials deposited before in Kew Garden herbarium, UK.

TAXONOMY

Ganoderma colossus (Fr.), C.F. Baker: The basidiocarps grow in a fan-like or hoof-like as rounded structures, cream to slightly yellow in colour on the base of the dead tree to dark brown on dead logs. The basidiocarps are spongy, sessile, bracket – like with maximum diameter of 73 cm on the base of

the tree and the thickest part attached to the base of the tree measured 12.4 cm and the outside edge was 3.5 cm thick. The upper surface of the basidiocarps was slightly yellow, brown to dark brown on the dead logs. The margin was obtuse to entirely or slightly undulate. Microscopic examination showed that the basidiospores were brown to pale brown, ovate, and ellipsoid to broadly ellipsoid, with a rounded base and a truncate to narrowly rounded apex, bitunicate and the outermost wall was attached to the inner wall by prominent inter-wall pillars (Fig. 4). The majority of the basidiospores measured (14.5-18.7 × 8.3-12.6 μm). The basidiocarps and basidiospores of *G. colossus* are similar to the Kew Garden herbarium specimen No. K [M] 137380 and as described on different plant species in Oman such as *Phoenix dactylifera* (Elshafie *et al.* 2006), *Ficus altissima*, *Delonix regia* (Al-Bahry *et al.* 2005), and *Sclerocarya birrea* (Elshafie *et al.* 2013).



Fig. 1. Basidiocarps of *Ganoderma colossus* invading the base of *Z. spina-christi* leading to the death of the tree.



Fig. 2. Basidiocarp of *G. colossus* on upper surface of *Ziziphus spina-christi* log. Scale = 30 cm



Fig. 3. Basidiocarp of *G. colossus* surrounding the log of *Ziziphus spina-christi*. Scale = 30 cm

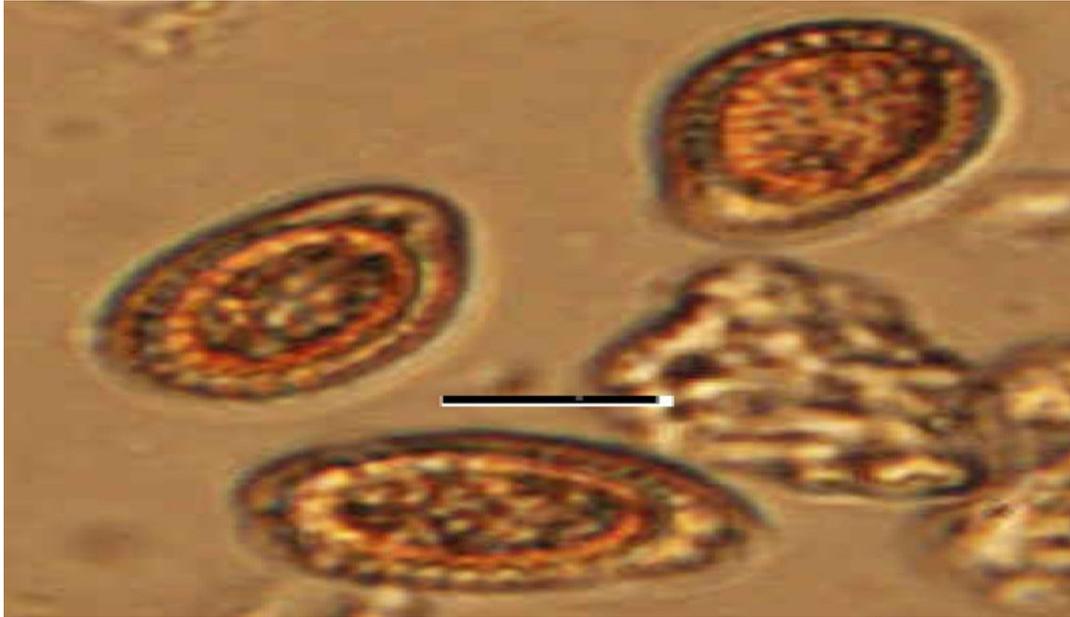


Fig. 4. Basidiospores of *Ganoderma colossum*. Scale bar = 5 μ m

Biology and diseases

Ganoderma colossum (Fr.) C.F. Baker (Basidiomycota, Ganodermataceae) is a polypore fungus detected on a wide variety of woody hosts. It is a pantropical species which was originally described from Costa Rica on *Ficus canariensis*. It causes selective and extensive delignification and decay of wood (Al-Bahry *et al.* 2005). It was reported on *Ficus carica* and *Ciltis laevigata* in the USA (Adaskaveg and Gilbertson 1988). Lückhoff (1955) reported *G. colossum* causing diseases on pines (*Pinus hondurensis*), *Callitris robusta*, and many *Eucalyptus* species including *E. citrodora*, *E. paniculata*, *E. punctata*, and *E. maculata*. It causes gradual yellowing and dying of foliage and weakening of the root collar by extensive rot of *P. hondurensis*. The disease was reported to be confined exclusively to the root system and the basidiocarps developed at the bases of the trees. This white-rot fungus (*G. colossum*) can cause wood decay of the date palm (*Phoenix canariensis*) (Adaskaverg *et al.* 1991). Chemical analysis indicated that the fungus caused losses of starch holocellulose and lignin and the starch grains were degraded. It was reported in Iran on the fallen logs on both hardwood and conifers, and on living trees as weak parasite

(Moradali *et al.* 2007). In Oman, the pathogen has been described on *Ficus altissima* and *Delonix regia* (Al-Bahry *et al.* 2005), *Phoenix dactylifera* (Elshafie *et al.* 2006), and associated with the dieback of *Sclerocarya birrea* (Elshafie *et al.* 2013). In the present investigations, this fungus was reported for the first time on the dead trees and logs of *Ziziphus spina-christi*. Our research is now focusing on the possibility of the invasion of other economically important hosts by this fungus and its potential occurrence throughout Oman.

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