

COMMUNICATION I

Ganoderma boninense Pat. from Basal Stem Rot of Oil Palm (*Elaeis guineensis*) in Peninsular Malaysia

ABSTRAK

Beberapa ratus sporofor bagi *Ganoderma* adalah dikumpulkan daripada kelapa sawit yang berumur 5 – 40 tahun dengan reputan pangkal batang dalam 5 buah estet kelapa sawit di Semenanjung Malaysia. Berdasarkan kepada kajian morfometrik bagi dimensi liang, desepimen dan basidiospora dan ciri-ciri morfologi lain bagi sporofor, sporofor itu dikenalpastikan sebagai satu spesies, *G. boninense* Pat.

ABSTRACT

Several hundred sporophores of *Ganoderma* were collected from 5 – 40 years old palm trees infected with basal stem rot in 5 oil palm estates in Peninsular Malaysia. Based on the morphometric studies of the pores, dessepiments and basidiospores dimensions and other morphological characteristics, the sporophores were identified as belonging to a single species, *G. boninense* Pat.

INTRODUCTION

The basal stem infection of oil palm (*Elaeis guineensis* Jacq.) by *Ganoderma* in Malaysia was first recorded by Thompson in 1931. For many years, the disease was thought to be economically unimportant as only very old palms over 25 years were infected. It was normal practice to leave the infected palm to rot away by itself in the field. Such was the situation until around 1957 – 1958 when *Ganoderma* infections were reported to be increasing in many estates and affecting much younger palms of around 5 years old. Basal stem rot was more prevalent in coastal areas than in inland areas and incidence of disease on young palms was higher in areas previously grown with coconut (Turner, 1965a). The disease is now considered to be the most annihilating disease of field palms causing significant losses in Southeast Asia (Turner, 1981). The disease has also been recorded in Indonesia, Nigeria, Ghana, Zaire, Cameroun, Angola, Tanzania and North Rhodesia (Turner, 1981).

The taxonomy of *Ganoderma* species associated with the disease is still controversial. In Malaysia, several *Ganoderma* species particular-

ly *G. lucidum* (Navaratnam, 1961; 1964; Turner, 1965b) had been reported to be the causal agent of the disease. However, reports of Steyaert (1967, 1972) showed that *G. lucidum* is confined mainly to temperate regions. This paper reports the identification of *Ganoderma* sporophores from palms infected with basal stem rot from various oil palm estates in Peninsular Malaysia.

MATERIALS AND METHODS

Collection of *Ganoderma* sporophores were made from infected field palms ranging from 5 – 40 years in Highland Estate, Kelang, Selangor; United Plantations, Teluk Intan, Perak; Oil Palm Research Station, Banting, Selangor; Layang-Layang Oil Palm Research Station, Johore and Federal Land Development Authority, Jerantut, Pahang. A hundred sporophores were collected from each of the estates mentioned. Sporophores were also collected from cut stumps (about 80 cm high) of infected oil palm from the same estates incubated in a shady area of the Botany Garden in University of Malaya.

The method for preparation of sporophore sections for microscopic examination was adapted from the method by Steyaert (1967). A sample of 10 pores, 10 dessepiments and 50 basidiospores were measured for each sporophore. For each pore, two perpendicular diameters were measured and for each basidiospore, the length and width were taken.

Basidiospores were collected either by squeezing the spores out of the pore layer onto the slides or by placing a clean slide under a sporulating sporophore. The basidiospores were mounted with Canada Balsam. Excess xylene from the Canada Balsam was eliminated by gentle warming. The basidiospores prepared by this method were found to retain their form and size without shrinkage.

The system of Steyaert (1967, 1972) was used for identification of *Ganoderma* species. All specimens identified were re-confirmed by Dr. R.L. Steyaert of Jardine Botanique De L'Etat, Brussel, Belgium.

RESULTS AND DISCUSSION

From macroscopic and microscopic examinations, the sporophores collected could be divided into 2 groups.

Sporophores in the first group measured up to 11 cm in diameter but the majority were about 5 cm in diameter. They were either stalked or sessile. Some were flat and bracket-shaped; others were lobed. The dorsal surface was glossy, blackish-brown in colour with concentric markings. The edge was white when fresh. The under-surface was also white. The cuticle was about 70 μm thick, underlain by a fine yellow margin. The bases of the tubes were auburn in colour. The cuticle was made up of globular, stalked elements, somewhat wedge-shaped, 30–50 μm long and 5–10 μm wide at the terminal globular part. The pores were circular, 110–300 μm in diameter. The dessepiments measured 30–130 μm and distances between the axes of pores were 185–235 μm . Basidiospores were yellowish-brown, ellipsoidal, 8.5–11.5 \times 5.2–6.5 μm .

The sporophores in the second group were much larger, usually measuring up to 15 cm in diameter. They were either stalked or sessile. The dorsal surface was shiny and varnished, orange-coloured in young sporophore, deepening to a dark-brown colour with concentric rings when mature. The growing margin was not white as in the first type but was orange. The cuticle was thin (about 40 μm) with globular elements measuring 60–75 μm long and 7–12 μm wide at the apex. The context layer was brown and very thick, constituting about $\frac{1}{3}$ to $\frac{2}{3}$ of the total thickness of the sporophore. The pores were circular, 90–220 μm in diameter, the dessepiments were about 20–100 μm thick and the distances between the axes of the pores were 110–220 μm . Basidiospores were pale-brown, ellipsoidal, averaging 9.0–12.5 \times 4.5–7.0 μm .

Personal communication with Steyaert confirmed sporophores of the first group to be *G. boninense* Pat. (Plate 1) and the sporophores of the second group was suggested to be "*G. minutocinctum* Stey.-like".



Plate 1: Sporophore of *G. boninense* on infected stem of oil palm.

It was observed that the morphology and size of the basidiospore, dessepiment, pore and the distance between the axes of the pores were similar in both *G. boninense* and *G. miniatocinctum*. However, the morphology of the sporophores and the measurements of the cuticle thickness were slightly different. It was mainly from these differences especially the orange border in the sporophore that Steyaert (1967) distinguished *G. miniatocinctum* as a separate species from *G. boninense*. However, later (1973, personal communication) Steyaert doubted the validity of separating *G. miniatocinctum* as a new species based mainly on the presence of the orange border. He felt that if the orange border was not permanent, *G. miniatocinctum* could be considered as a synonym of *G. boninense*. Since the orange borders of the sporophores of the second group ("G. miniatocinctum-like") were not distinct when the sporophores stopped growing it is very likely that sporophores of this group are also *G. boninense*.

The measurements of the sporophores and basidiospores of *G. boninense* in this study were quite similar to those reported by Varghese *et al.*, (1976) for unidentified *Ganoderma* species from basal stem rots of oil palm. The morphological characteristics of their sporophores and basidiospores (pore size, 122.8–179.8 μm ; dessepiment thickness, 81.8–179.3 μm ; basidiospore, 6.4–12.5 \times 3.6–6.8 μm) conformed with those of *G. boninense*. They also reported that the morphological and physiological characteristics of the *Ganoderma* species causing basal stem rot in oil palm were clearly different from the *Ganoderma* species causing basal stem rot in tea and *Hevea* rubber.

It is found from the present survey of *Ganoderma* in the various oil palm estates that *G. boninense* is not confined to any one area but is present in all the estates surveyed. The species can cause serious infection in palms above 5 years of age.

Steyaert (1967) reported that the hosts of *G. boninense* (specimens sent by Turner in 1965,

collected from the Oil Palm Research Station, Banting) were mainly coconut palms. Now, *G. boninense* is found to be associated with basal stem rot of oil palm not only in Banting estate but also in many other oil palm estates.

Previous reports by other workers (Varghese *et al.*, 1976; Turner, 1981) suggested that several species and not just one species may be involved in causing the disease but whether the species are all equally virulent and whether dual or multiple infection can occur are not known (Turner, 1981).

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