

Basal stem rot (BSR) of oil palm is a disease caused by a few species of *Ganoderma* (Idris *et al.*, 2000a, b). It is a major disease inflicting significant losses in Southeast Asia, especially in Malaysia and Indonesia (Turner and Gillbanks, 2003). The disease causes the death of more than 80% of oil palm plantings midway through their economic life. Fungicidal treatment of *Ganoderma*-infected palms is rather limited because once the palms show visible symptoms of the disease, the infection is already firmly established (Turner and Gillbanks, 2003). Trials with triazole fungicides injected into palm stems and disease lesions have been shown to prolong the lives of diseased standing palms rather than curing them of the disease. A carboxin-quintozene mixture appeared to be effective through trunk injection, prolonging the lives of about 91% of the palms by 69 months after treatment (George *et al.*, 1996). It was also noted that cyproconazole was able to sustain 97% of the *Ganoderma*-infected palms. The Malaysian Palm Oil Board (MPOB) has demonstrated that the application of hexaconazole onto diseased standing palms using a trunk injector limited the spread of *Ganoderma* infection within the palm trunk (Idris *et al.*, 2002; 2004).

The efficacy of hexaconazole (a systemic fungicide) for controlling of *Ganoderma* in mature palms as a preventive treatment was studied. Hexaconazole was chosen for the study based on its effectiveness and low effective concentration (EC_{50} , $0.026 \mu\text{g ml}^{-1}$) against *G. boninense* compared with other fungicides tested *in vitro*, such as azoxystrobin ($0.53 \mu\text{g ml}^{-1}$), carbendazim ($2.49 \mu\text{g ml}^{-1}$), quintozene ($51.08 \mu\text{g ml}^{-1}$), copper oxychloride ($1042.75 \mu\text{g ml}^{-1}$) and sulphur ($>10\ 000 \mu\text{g ml}^{-1}$) (Idris and Arifurrahman, 2008).

METHODOLOGY

The study was conducted at two sites totalling approximately 6 ha, each having cases of BSR incidence: 10-year-old second generation palms on peat soil in Teluk Intan, Perak, and 16-year-

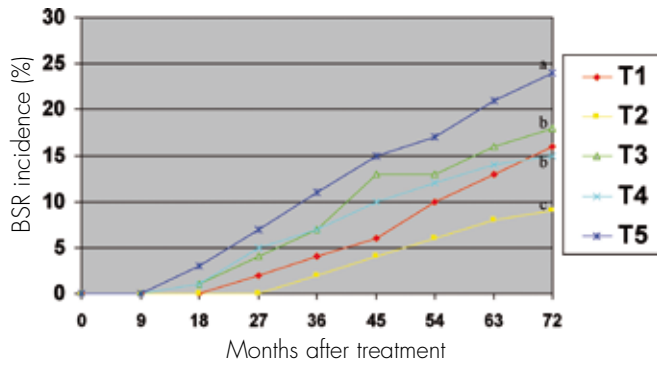
old first generation palms on mineral soil (Renggam series) in Kluang, Johor. Five hundred healthy mature palms were identified for this study which comprised five treatments, with 100 healthy mature palms for each treatment. The five treatments were:

- healthy palms treated with hexaconazole at 4.5 g active ingredient (a.i.), and applied as a soil injection;
- healthy palms treated with hexaconazole at 9 g a.i. and applied as a soil injection;
- healthy palms treated with hexaconazole at 4.5 g a.i., and applied as a soil drench;
- healthy palms treated with hexaconazole at 9 g a.i., and applied as a soil drench; and
- healthy palms untreated (as the control).

Each treated palm was given 9 or 6 litres of the fungicide mixture. The fungicide was applied at approximately 9-month intervals for six years (72 months), either as a soil injection or as a soil drench (Figure 1). Results indicate that in healthy palms treated with hexaconazole the incidence of BSR was reduced compared with untreated palms at 18, 27, 36, 45, 54, 63 and 72 months after treatment, and no BSR incidence was observed at nine months after treatment (Figures 2 and 3). At six years (72 months), healthy palms treated with hexaconazole applied through soil injection and soil drenching gave significantly lower percentages of palms with BSR incidence compared to the untreated palms.



Figure 1. Application of hexaconazole to control *Ganoderma* in oil palm through soil drenching (1A) or soil injection (1B).



Treatments:

- T1 - Soil injection + 90 ml hexaconazole (4.5 g a.i)
- T2 - Soil injection + 180 ml hexaconazole (9 g a.i)
- T3 - Soil drenching + 90 ml hexaconazole (4.5 g a.i)
- T4 - Soil drenching + 180 ml hexaconazole (9 g a.i)
- T5 - Untreated (as control)

Figure 2. Effect of hexaconazole on basal stem rot (BSR) incidence (%) in oil palms at Teluk Intan, Perak. Means with the same letter denote no significant difference according to the Least Significant Difference (LSD) test at $p=0.05$.

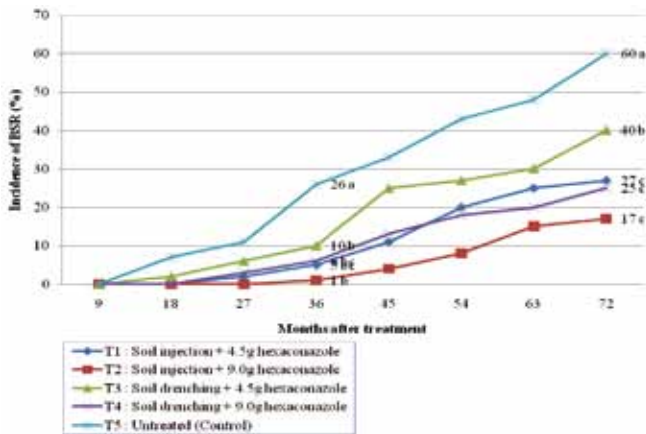


Figure 3. Effect of hexaconazole on basal stem rot (BSR) incidence (%) in oil palms at Kluang, Johor. Means with the same letter denote no significant difference according to the Least Significant Difference (LSD) test at $p=0.05$.

SERVICE OFFERED

MPOB offers the service of controlling *Ganoderma* disease in oil palm plantation, using hexaconazole as a preventive treatment. Once the service is completed, a full report along with the relevant data will be submitted to the relevant person/company.

BENEFITS AND COST

The results from two field trials suggest that hexaconazole has the potential of reducing the risk of *Ganoderma* infection in healthy mature oil palm. The service offered is a method of controlling *Ganoderma* in oil palm plantations. The cost will vary depending on the area and severity of BSR disease in the plantation.

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