

INNOVATIVE TECHNIQUE OF SANITATION FOR CONTROLLING *Ganoderma* AT REPLANTING

by: IDRIS, A S; ISMAIL, S and ARIFFIN, D

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The threat of *Ganoderma*, the causal agent of basal stem rot (BSR) disease to the oil palm industry in Malaysia warrants new and more aggressive approaches in finding solution to this disease. The situation is more critical with the active replanting of second generation of oil palm which is currently being carried out in some plantations including areas with bad history of *Ganoderma*. Correct techniques of land preparation at the time of oil palm replanting are regarded as an important practice for controlling the BSR disease. These control strategies are based on observations that infection occurs by mycelial spread through root to root contact. Although the clean clearing technique gave lower disease incidence in oil palm replanting compared to windrowing and underplanting (Khairudin, 1990), it was however not entirely satisfactory in reducing the disease incidence. Incidence as high as 2.8%-32.4% was reported despite the adoption of this technique (Singh, 1990). Since tissues of the former stand of oil palms are the primary source of infection at replanting, disease avoidance through sanitation is important. This paper reports the efficacy of sanitation in the old oil palm stands for controlling BSR disease during replanting.

EFFECTS OF EXCAVATING SOIL AND DISEASED STUMPS ON BAIT SEEDLINGS

The importance of BSR infected stumps as a focus of new infection is of considerable relevance to planting point sanitation. This was shown by results of a trial in which bait seedlings were planted at different levels of BSR points. Khairudin (1990) reported that 93% of seedlings

growing around diseased stumps (0.3 m distance) left in the field became infected within 18 months. By contrast, only 7% of seedlings growing around sites, which has been excavated (1 x 1 x 1 m pit) to remove diseased stumps, became infected. In another investigation, the diseased roots and stumps were excavated leaving pits with the following sizes: 0.5 x 0.5 x 0.5 m, 1 x 1 x 1 m, 1.5 x 1.5 x 1.5 m, 2 x 2 x 2 m and 2.5 x 2.5 x 2.5 m (Figure 1) (Ariffin and Idris,

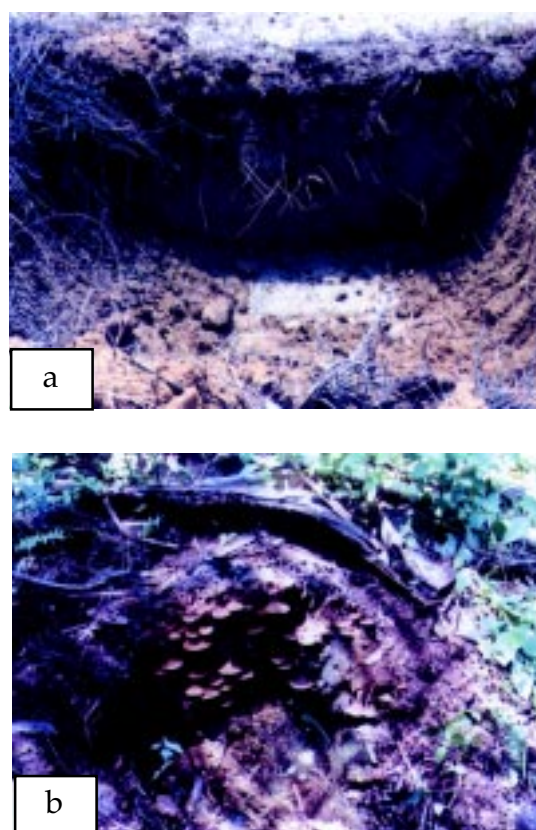


Figure 1. (a) Excavated and (b) non-excavated diseased palms. A bait seedling was planted at each treatment and the progress of *Ganoderma* infection was recorded.

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Malaysian Palm Oil Board, Ministry of Plantation Industries and Commodities, Malaysia
P. O. Box 10620, 50720 Kuala Lumpur, Malaysia. Tel: 03-89259155, 89259775, Website: <http://mpob.gov.my> Telefax: 03-89259446



2002). The pits were then covered with soil obtained from the inter-rows and planted with a bait seedling. These treatments were compared with diseased and healthy stumps that were not excavated and planted with bait seedling at a distance of 60 cm. The experimental design was completely randomized design with 16 replications.

Disease assessment on bait seedlings were recorded based on visual symptoms including progressive yellowing or desiccation of oldest to youngest fronds and death of seedlings with or without *Ganoderma* fructifications. Two years after planting, all seedlings were excavated and cut longitudinally to examine the internal symptoms of the *Ganoderma* infection in roots and stem tissues, and also confirming the presence of *Ganoderma* by plating samples on the *Ganoderma* selective medium (GSM). Results are summarized in *Table 1*. Without any excavation, 87.5% of seedlings had become infected within two years from planting. Seedlings infection decreased to 81.2% and 37.5% where soil and diseased stump had been excavated to 0.5 x 0.5 x 0.5 m and 1 x 1 x 1 m, respectively. No disease was recorded on bait seedlings in treatments where soil and diseased stump had been excavated to 1.5 x 1.5 x 1.5 m, 2 x 2 x 2 m, 2.5 x 2.5 x 2.5 m and also where healthy stumps were not excavated.

EFFECTS OF SANITATION IN THE OLD STAND ON BSR INCIDENCE IN THE NEW REPLANTED OIL PALMS

The study was started in 1992 on flat, coastal soil and planted with oil palm in 1963 (first

generation) and replanted in 1993 (second generation) at Sepang, Selangor. Two treatments were evaluated either with or without sanitation and each treatment was replicated three times. Plot size was about 1 ha (144 palms plot⁻¹) giving a total of 6 ha (432 palms treatment⁻¹). These two treatments are as follows: T1-without sanitation (estate practices including pushing the old stands, shredding, stacking and single burning), and T2-sanitation (estate practices + excavating soil and the old stumps + ploughing and rotovating).

BSR census in the old stand was carried out and mapped at the time of replanting and the results are presented in *Table 2*. Mean BSR incidence in ex-oil palms (first generation) was 39.9% in areas without sanitation and 43.3% in sanitation areas. The effectiveness of treatments were evaluated by checking the BSR disease symptoms on replanted palms at 6-month intervals for one, two and three years after planting and at one-year interval for the following years of planting. The results are summarized in *Table 2* and *Figure 2*. Sanitation by excavating soil and the old stumps, ploughing and rotovating, prior to replanting had significantly lowered the incidence of BSR on the replanted palms. Ten years after replanting, the BSR incidence was less than 1% in sanitation areas compared to more than 13% in areas without sanitation.

TECHNIQUE OF SANITATION AT REPLANTING

The following technique of sanitation is recommended for minimizing the incidence of BSR disease in a replanting area, especially in areas with history of BSR incidence:

TABLE 1. EFFECTS OF EXCAVATING SOIL AND DISEASED STUMP AT BSR POINTS ON SEEDLING INFECTION WITH *Ganoderma*, TWO YEARS AFTER PLANTING

Treatment	% Seedlings infected
Diseased stumps not excavated	87.5
Diseased stumps excavated – 0.5 x 0.5 x 0.5 m	81.2
– 1 x 1 x 1 m	37.5
– 1.5 x 1.5 x 1.5 m	0
– 2 x 2 x 2 m	0
– 2.5 x 2.5 x 2.5 m	0
Healthy stumps not excavated (control)	0

TABLE 2. MEAN INCIDENCE OF BSR (%) IN EX-OIL PALMS AND ON REPLANTED PALMS WITH AND WITHOUT SANITATION IN THE OLD STANDS#

Technique of sanitation in the old stands	Mean BSR incidence in ex-oil palms (%)	Mean BSR incidence on replanted palms at 10 years (%)
Without sanitation (estate practices including pushing the old stands, shredding, stacking and single burning)	39.95	13.81
Sanitation (estate practices + excavating soil and the old stumps + ploughing and rotovating)	43.38	0.93

Notes: #No. of plots: 3.
 No. of palms plot⁻¹: 144.
 Total No. of palms treatment⁻¹: 432.

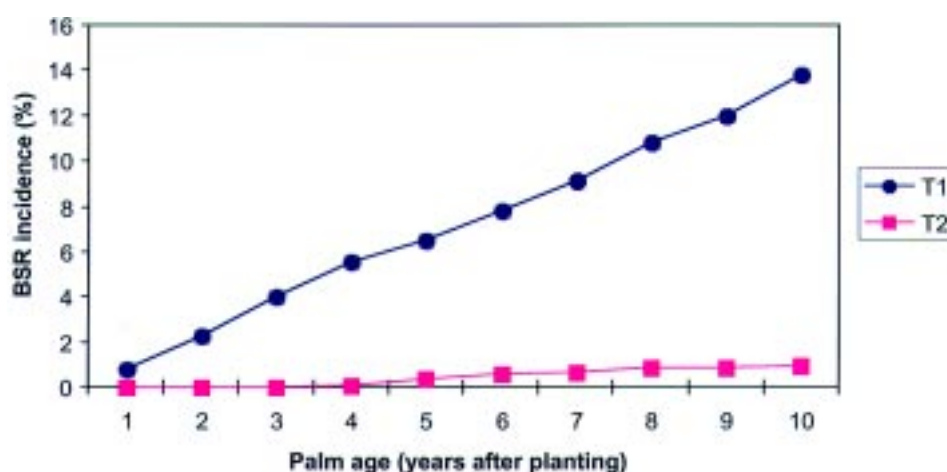


Figure 2. Effects of sanitation on BSR incidence in the replanted palms (T1 - without sanitation and T2 - with sanitation).

- Step 1 – mechanical pushing of the old stands (Figure 3a).
- Step 2 – destroying the old palm tissues by shredding the trunk, stump and root masses into small fragments, later spreading them as evenly along the old planting row to decompose (Figure 3a).
- Step 3 – excavating soil and the old stumps by digging a pit (1.5 m width x 1.5 m length x 1.5 m depth) and refilling with nearby soil (Figure 3b).
- Step 4 – ploughing between the old planting areas or along the new replanting row

- followed by rotovating (Figure 3c).
- Step 5 - planting of new palms along the ploughing areas and away from the old planting row (Figure 3d).

CONCLUSION

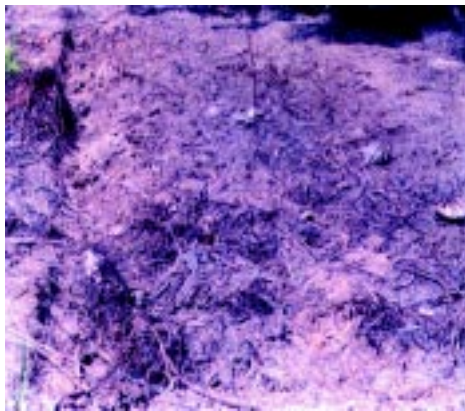
Diseased stumps are the most highly infective tissues. When suitable disease inoculum is present, *Ganoderma* can attack oil palm soon after planting. Sanitation by excavating soil and the old stump tissues by digging a pit (1.5 m width x 1.5 m length x 1.5 m depth), followed by ploughing and rotovating inter-rows, and



a. Pushing and destroying.



b. Excavating.



c. Ploughing and rotovating.



d. Planting of new palm.

Figure 3. Technique of sanitation at replanting.

planting the new palms away from the old planting row is recommended as a means of minimizing the incidence of BSR after replanting. By practising this method, BSR incidence on replanted palms can be significantly reduced.

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For more information kindly contact:

Director-General
MPOB
P. O. Box 10620
50720 Kuala Lumpur, Malaysia.
Tel: 03-89259155, 89259775
Website: <http://mpob.gov.my>
Telefax: 03-89259446