GanoCare™ – REDUCING RISK OF *Ganoderma* INFECTION IN OIL PALM

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Basal stem rot (BSR) disease caused by the *Ganoderma* species is a serious problem to the oil palm industry (Idris, 2012). MPOB has introduced the Integrated *Ganoderma* Management (IGM) to find solution to the disease (Idris, 2011). Plant nutrients are primary components of disease control in many crops (Sharma, 2006; Mcmahon, 2012). Nutrients are inorganic elements that have essential and specific functions in plant metabolism. Mineral nutrients are commonly used in fertilisers to enhance plant growth though the regulation of plant metabolism such as improved nitrogen fixation and rhizobial growth. In other words, it is beneficial in the protection against abiotic and biotic stresses. The importance of applications of balanced nutrients that has to be considered for reducing risk of *Ganoderma* in oil palm in order to increase yield and cost-effectiveness of fertiliser usage (Mohd Tayeb *et al*., 2013).

THE TECHNOLOGY – GanoCare™

The GanoCare™ was formulated for the prevention of *Ganoderma* disease in oil palm. The product contains powdered empty fruit bunches (EFB) incorporated with trace elements. The process of mass production of GanoCare™ was established (*Figure 1*) and patented.

EFFECTS OF GanoCare™ ON VEGETATIVE GROWTH OF OIL PALM SEEDLINGS

The effects of GanoCare™ on the vegetative growth of oil palm seedlings was carried out at FELCRA Seberang Perak, Batu Gajah, Perak.

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Figure 1. Process of mass production of GanoCare™. (a) Mixing of raw materials, (b) pelletising, (c) packaging, and (d) final product.

Three treatments were evaluated (*Table 1*) with 45 seedlings per treatment. The treatment were: T1-untreatred seedlings (control); T2-seedlings treated with GanoCare™ applied at monthly intervals (nine applications, total 450 g/seedling); and T3-seedlings treated with GanoCare™ applied at three-monthly intervals (three applications, total 450 g/seedling). At nine months, seedlings treated with GanoCare™ (treatments T2 and T3) had significant increase in total numbers of fronds, height, girth, rachis length, total dry weights (leaf, stem and roots) and leaf area (*Table 1*). Scanning electron microscopy showing that cell wall of roots of seedling treated with GanoCare™ were thicker than those of the untreated seedlings (*Figure 2*).

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TABLE 1. EFFECTS OF GanoCare™ ON VEGETATIVE GROWTH OF OIL PALM SEEDLINGS, NINE MONTHS AFTER TREATMENT

Treatment	*Total number of fronds	*Seedling height (cm)	*Girth (mm)	*Rachis length (cm)	*Chloro-phyll (Chl SPAD)	*Total dry weight (g)	*Leaf area (m^2)
T1	14c	149.7b	80.16c	74.81b	57.7a	250c	1.277b
T2	16a	160.3a	89.49a	84.97a	59.8a	300a	1.391a
T3	15b	150.1b	87.70b	75.40b	58.1a	280b	0.944c

Note: *Columns with the same letter indicates no significant different at $p<0.05$ using LSD.
T1-untreatred seedlings (control); T2-seedlings treated with GanoCare™ applied at monthly intervals (total 450 g/seedling); and T3-seedlings treated with GanoCare™ applied at three-monthly intervals (total 450 g/seedling).

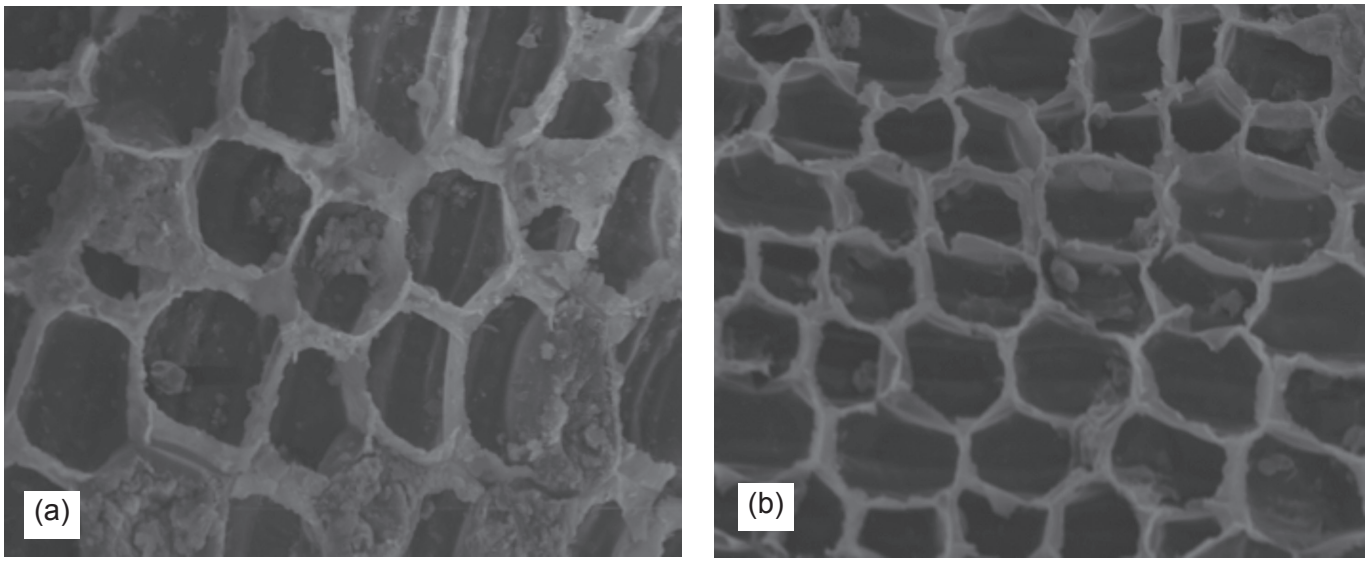

Figure 2. Scanning electron microscopy (magnification 450X) showing section of oil palm root. Cell wall of root of seedling treated with GanoCare™ (a) has thicker compared with root of untreated seedling (b).

EFFECTS OF GanoCare™ IN CONTROLLING *Ganoderma* DISEASE IN OIL PALM SEEDLINGS

The effectiveness of GanoCare™ in controlling BSR disease in oil palm seedlings was evaluated using two treatments with 30 seedlings per treatment: T1-untreated seedlings (control); and T2-seedlings treated with GanoCare™ applied at monthly intervals (nine applications, total 450 g/seedlings). Seedling was inoculated with *G. boninense* using rubber wood block sitting technique (Idris *et al*., 2006). The disease assessments were measured as disease incidence (DI), dead seedlings (DS) and disease reduction (DR) were recorded. This study was conducted for 10 months. At eight months, the DI of seedlings treated with GanoCare™ (43.3%) was significantly ($p<0.05$) different compared to that of untreated seedlings (90.0%). Seedlings treated with GanoCare™ recorded significantly ($p<0.05$) lower of dead (40.0%) as compared to untreated seedlings (86.7%). BSR disease incidence was reduced 63.5% in seedlings treated with GanoCare™ (*Table 2*).

EFFECTS OF GanoCare™ IN CONTROLLING *GANODERMA* DISEASE IN FIELD PLANTED OIL PALM

Field testing of the GanoCare™ to control *Ganoderma* disease was investigated through seedling baiting technique at two sites in Perak: Teluk Intan and FELCRA Seberang Perak. Two treatments

TABLE 2. EFFECTS OF GanoCare™ ON BASAL STEM ROT (BSR) DISEASE DEVELOPMENT IN OIL PALM SEEDLINGS AT EIGHT MONTHS AFTER TREATMENT

Treatment	Dead incidence (%)*	Dead seedlings (%)*	Disease reduction (%)
Untreated seedlings (control) and inoculated with *G. boninense* (T1)	90.0a	86.7a	63.5
Seedlings treated with GanoCare™ and inoculated with *G. boninense* (T2)	43.3b	40.0b	

Note: *Columns with the same letter indicates no significant difference at $p<0.05$ using LSD.

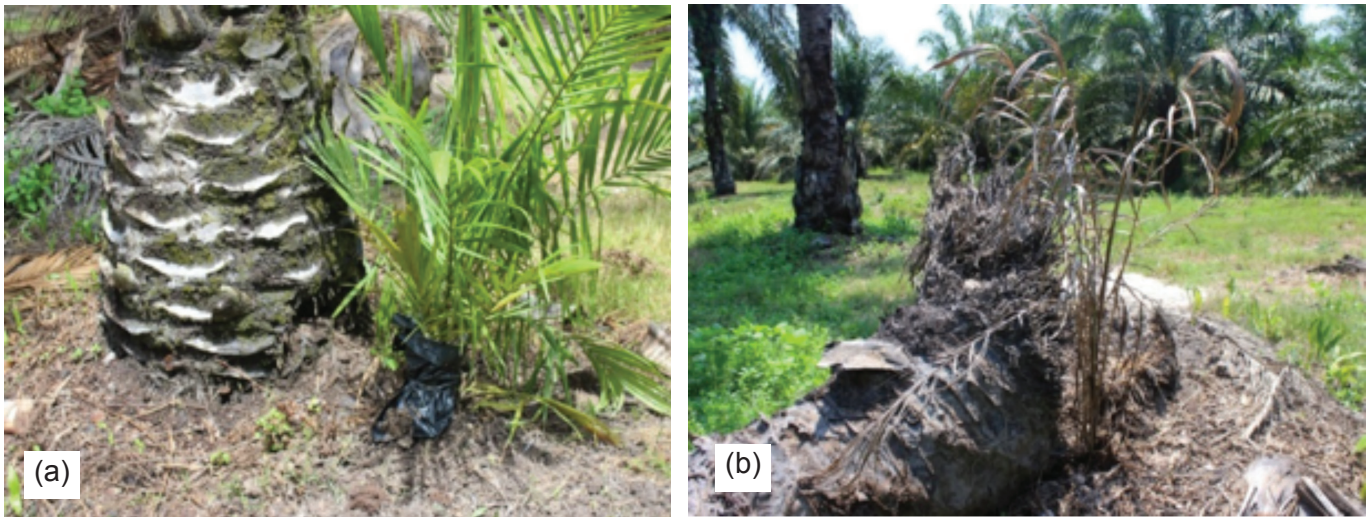

Figure 3. Field evaluation of GanoCare™ through seedling baiting technique, 30 months after planting. (a) Seedling treated with GanoCare™ with no Ganoderma *infection, and (b) untreated seedling dead due to* Ganoderma *infection.*

were evaluated: T1-untreated seedlings (control); and T2-seedlings treated with GanoCare™. Thirty seedlings were used per treatment. Twelve-month old seedlings were planted 35 cm away from *Ganoderma* infected palm (*Figure 3*). For treated seedlings, GanoCare™ was applied in nursery (nine times, at monthly interval, 50 g/seedling/application) and in field (one time, one month after planting at 500 g/seedling). Disease assessments were carried out at three-monthly intervals. After 30 months, no symptoms of BSR disease and dead palms were observed on seedlings treated with GanoCare™. About 23.3% (14 out of 60 palms) of the untreated seedlings were dead due to *Ganoderma* infection. Palm dead due to *Ganoderma* was confirmed using the *Ganoderma* selective medium (GSM) as described by Ariffin and Idris (1992).

CONCLUSION

The use of GanoCare™ can reduce risk of *Ganoderma* infection in oil palm, therefore reducing potential yield losses due to BSR disease in oil palm plantations.

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