GANO ENZYME TEST REPORT ON LADANG ELDRED (JOHORE) BOUSTEAD

BY

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SYNOPSIS

1) Ganoderma Boninense BSR is very prevalent in the Oil Palm plantation.

2) The disease occurs in :-
   a) Natural Setting,
   b) Highly Well maintained transplanted landscape,
   c) Well Drained Setting,
   d) In Peat or Swampy soil area.

3) The Ganoderma spores are:-
   a) Found mainly in the roots of tree.
   b) Parasite, taking nutrients & water from soil.
   c) Prevent root growth and initiate stem rot.
   d) Remain in soil for generations.

SYNOPSIS

4) Existing Standard of control:
   a) Removal of Infected Palm
   b) Using Fungicide as preventive measure.
   c) Soil Mounding: to extend life of tree.
   d) Herbicide & Pesticide etc.
   e) Trenching or Replanting.
   All the above methods were ineffective. Ganoderma spores still propagate rampantly in the soil.

5) In Malaysia, it was reported by MPOB that :
   a) 59,000 hectares were seriously infected and growing.
   b) Infection rate: In 1999 was 1.1%, In 2010 was 3.7%.
   c) Loss in revenue year 2009 / 2010 was RM 1.1 Billion.

6) Our Soil is "DEAD"
   a) Due to years of Chemical Fertiliser, Pesticides, Fungicides, etc. applications have "Killed" the Eco and Micro Organism communities in the soil.
   b) We believe , that the good microbes concentration in the soil to control the Ganoderma fungi is not enough, hence the Ganoderma proliferation in the Oil Palm Plantation.

SYNOPSIS

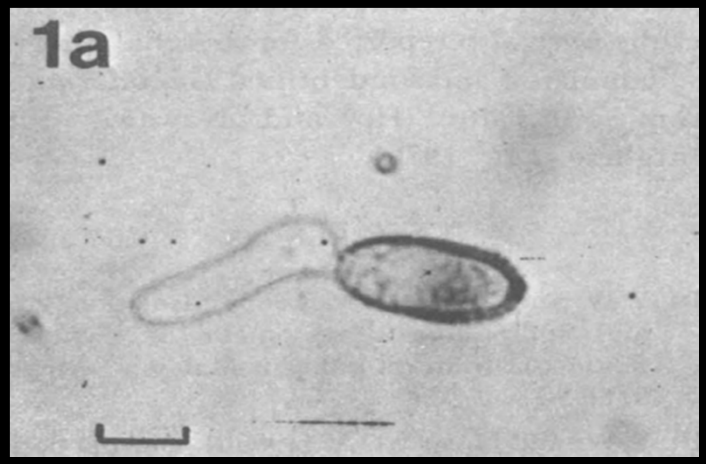
7) The solution to this problem, we believe should start with soil treatment i.e. to enrich the soil with beneficial bacteria enzyme and microbes to check and control the ganoderma spores in the roots.

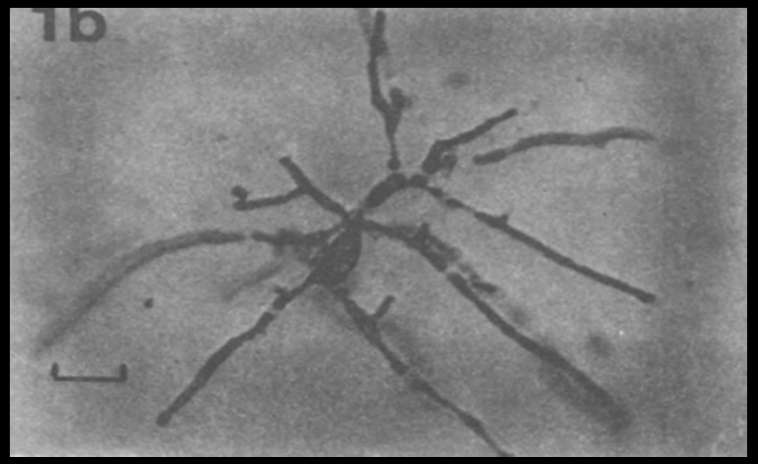
8) Our GanoEnz treatment does exactly that, by introducing the good bacteria enzyme to attack, destroy and produce antibody against future ganoderma attack.

9) Our GanoEnz contains 21 types of Advanced Beneficial Microbial (ABM) enzymes.

4 Types of Ganoderma found in Oil Palm Tree

GERMINATION STUDIES OF G. *BONINENSE* SPORES FROM OIL PALMS IN MALAYSIA





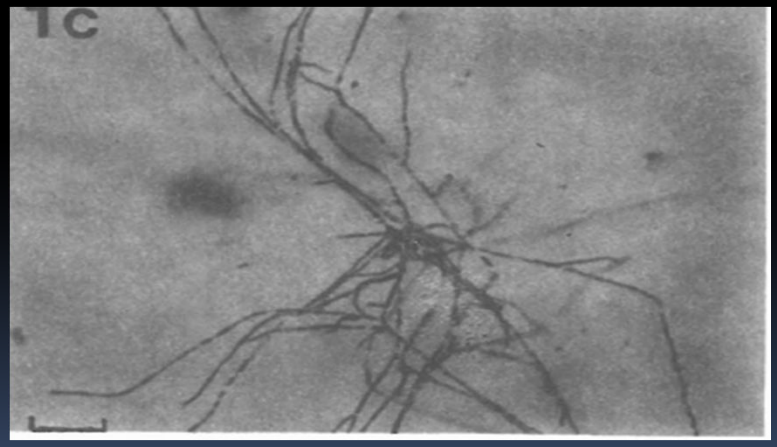
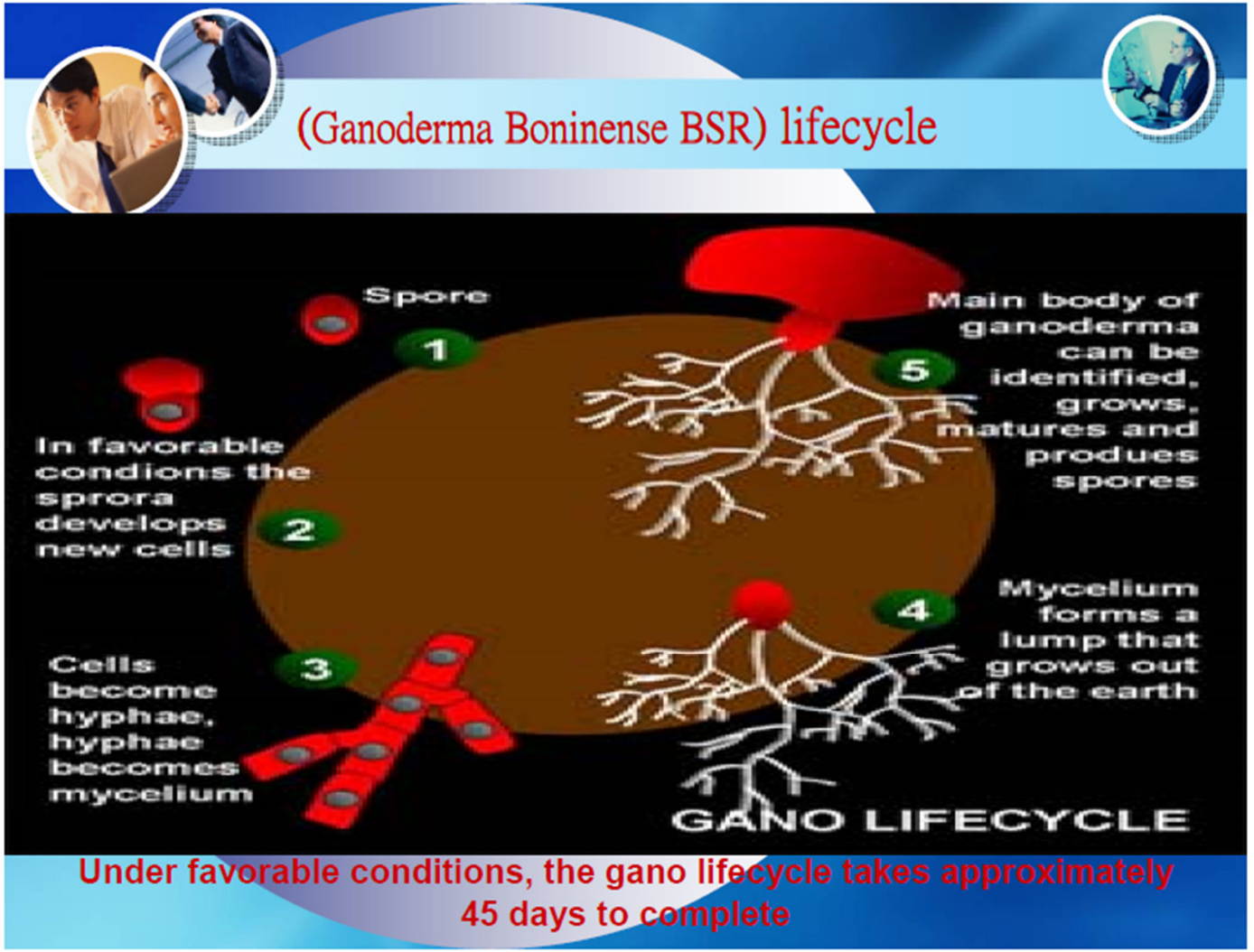


Fig. 1: *Germinated spores of G.* boninense, *(a) after 30 hrs (bar =*5 *Um); (b) after* 48 *hrs (bar = 10 Um); (c) after* 72 *hrs (bar =* 25 *Um)*

Photo 1: White growth is hyphae of Ganoderma Zonatum after incubation in moist chamber for 4 days, and corresponded with the discolored area of the cross sections.


(Ganoderma Boninense BSR) lifecycle
Spore
1
In favorable condions the sprora develops new cells
2
Cells become hyphae, hyphae becomes mycelium
3
Mycelium forms a lump that grows out of the earth
4
Main body of ganoderma can be identified, grows, matures and produes spores
5
GANO LIFECYCLE
Under favorable conditions, the gano lifecycle takes approximately 45 days to complete

Spread of Ganoderma Spore in Oil Palm Plantation

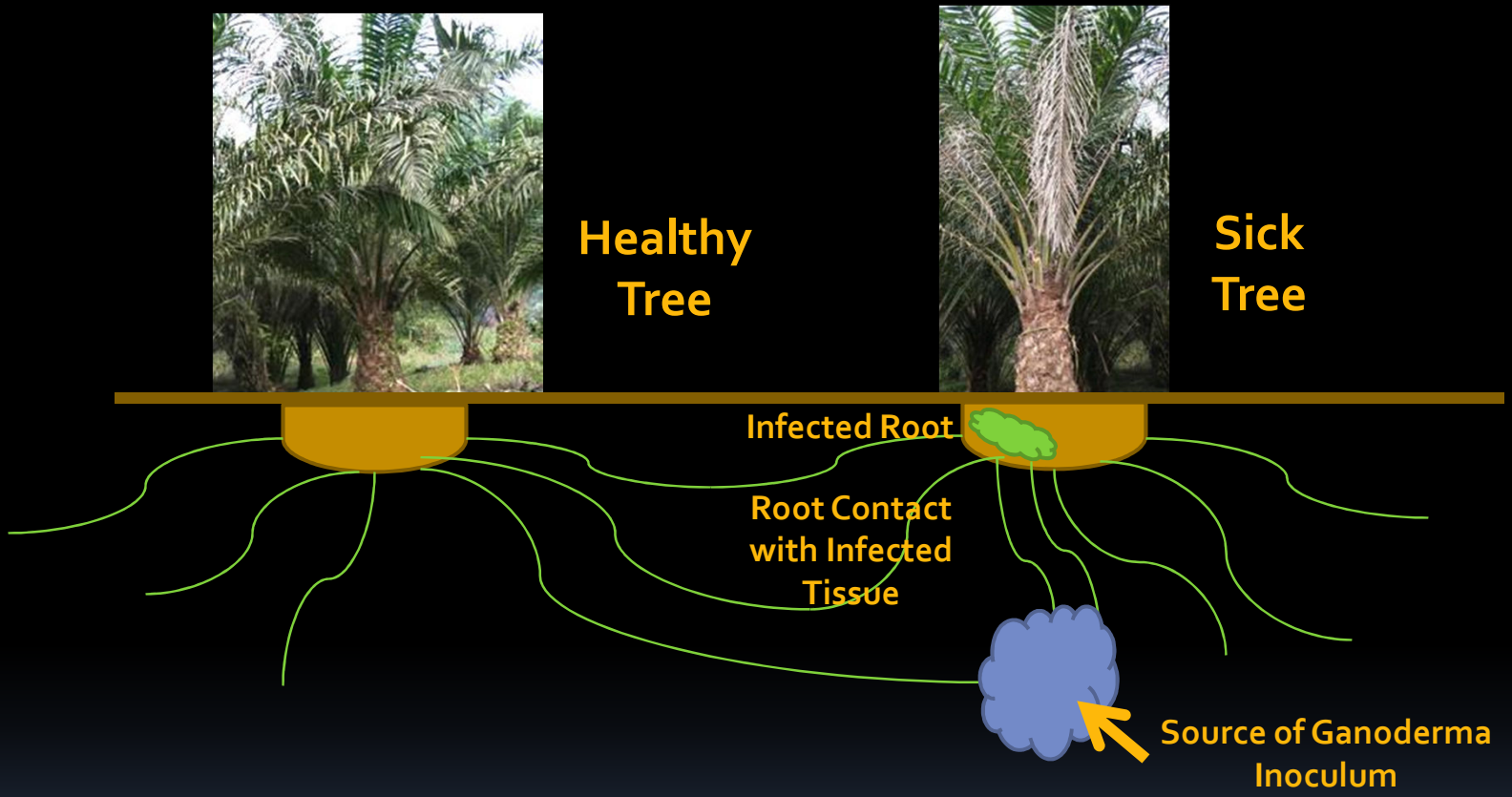


Figure 1. Ganoderma fruiting bodies (mushrooms) found at the bottom of sick oil-palm stem.

Figure 2. Oil palm trees (A) Healthy tree, (B) tree attacked by ganoderma: the lower leaves have reclined to form a skirt-like crown.

Figure 3 :(C) several unopened spears at the top of a sick tree canopy, (D) yellowing and early necrosis on leaves of a sick tree.

Table 1. Ganoderma-specific visual symptoms used in the fields to classified the trees into the three levels of disease severity.

Infection Degree	Evolution of stem conditions	Evolution of canopy structure
Level 1	**Presence of mycelium in the stem bark, or crumbly wood**	**Yellowing or drying of some leaves. One or two new leaves remain as unopened spears.**
Level 2	**Presence of fruiting bodies (mushrooms) at the bottom of the stem**	**Apparition of leaf necrosis. Three to five new leaves remain as unopened spears. Declination of older leaves.**
Level 3	**Rotten stem**	**Largely spread leaf necrosis. No new leaf. No new bunch. «Skirt-like» shape of crown due to total leaf declination.**

CMS GANO-ENZ PRODUCTS A & B

TEST METHOD AND PROCEDURE

1) We select 18 infected trees age from 10 to 20 years.

2) To Test for a period of 2 months with 3 applications.
If very serious case, we may need 4 applications.

3) 1st Application was done on 7 July 2011.
2nd Application was done on 14 July 2011.
3rd Application was done on 02 August 2011.
4th Application was done on 18 August 2011.

4) Mixing ratio is 1: 250

5) The water from tap for mixing must be left over night to let for chlorine to escape. Otherwise the chlorine in the water will destroy the enzymes.

6) Use new back packed sprayer.

7) Observational photo will be taken every week for comparison purpose on root growth, adult ganoderma destruction, any new fresh fruit bunches, new fonds, spores destruction etc.....

MIXING TECHNIQUE

MIXING RATIO 1:250
MIX : A & B TOGETHER
(AFTER DILUTION)

POURING MIXTURE INTO SPRAYER

SPRAYING TECHNIQUE

3.5L (diluted) on soil about 2 to 3 ft radius on the ground around the tree base

1.5L (diluted) Spray on the Basidocarp (Adult Gano) around the trunk.

OBSERVATIONAL PHOTO

COMPARISION

for GANODERMA B

LADANG ELDRED BOUSTEAD

7 JULY 2011

New Gano Growth
(14 July 2011)

New Green Growth (14 July 2011)

No New Gano
(2 AUGUST 2011)

18 AUGUST 2011

LADANG ELDRED BOUSTEAD

7 JULY 2011

New Roots
(14 JULY 2011)

2 AUGUST 2011

New Roots (18 AUGUST 2011)

LADANG ELDRED BOUSTEAD

7 JULY 2011

14 JULY 2011

New Ganoderma (Basidocarp) (14 July 2011)

NECROSIS OF GANODERMA

LADANG ELDRED BOUSTEAD

7 JULY 2011

14 JULY 2011

LADANG ELDRED BOUSTEAD

7 JULY 2011

NECROSIS OF GANODERMA

14 JULY 2011

18 AUGUST 2011 (NEW ROOTS)

LADANG ELDRED BOUSTEAD

7 JULY 2011

NEW GANO (small buttons)

14 JULY 2011

NEW GANO (Destroyed)

NEW ROOTS (18 AUGUST 2011)

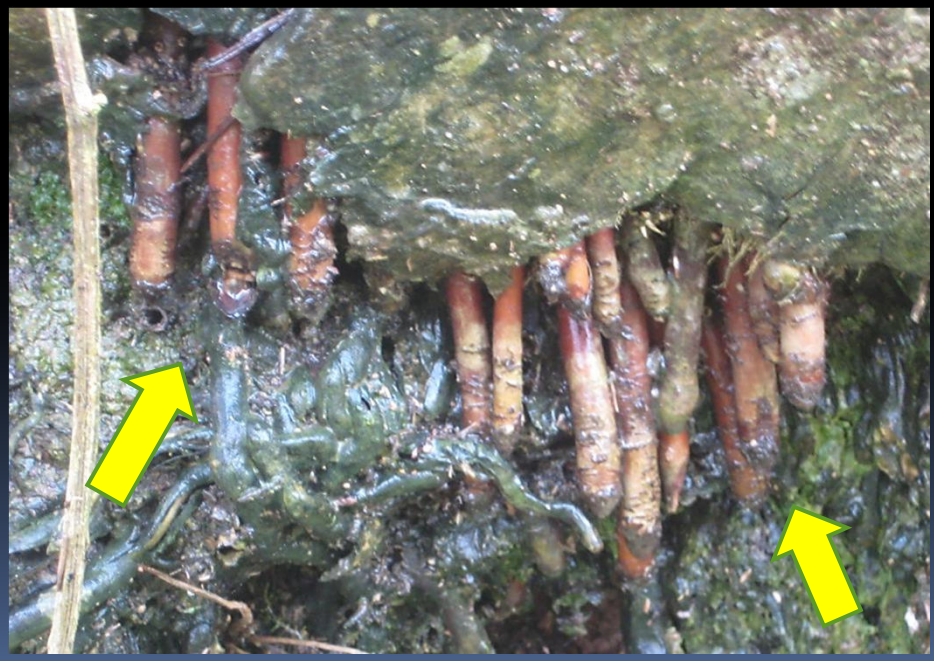
LADANG ELDRED BOUSTEAD

7 JULY 2011

14 JULY 2011

Dead & Dried Basidocarp

2 AUGUST 2011



NEW ROOTS (18 AUGUST 2011)

LADANG ELDRED BOUSTEAD

7 JULY 2011

14 JULY 2011

NECROSIS OF GANODERMA

LADANG ELDRED BOUSTEAD

7 JULY 2011

14 JULY 2011

7 JULY 2011

14 JULY 2011

LADANG ELDRED BOUSTEAD

New Ganoderma
(14 July 2011)

LADANG ELDRED BOUSTEAD

7 JULY 2011

14 JULY 2011

2 AUGUST 2011 & 18 AUGUST 2011 – NO NEW GANO

OBSERVATIONAL PHOTO

COMPARISION

for

TREES (FRONDS)

LADANG ELDRED BOUSTEAD

2 AUGUST 2011

18 AUGUST 2011

LADANG ELDRED BOUSTEAD

2 AUGUST 2011

18 AUGUST 2011

7 JULY 2011

14 JULY 2011

2 AUGUST 2011

18 AUGUST 2011

HEALTHY FRONDS / SPEARS

LADANG ELDRED BOUSTEAD

7 JULY 2011

HEALTHY FRONDS / SPEARS

2 AUGUST 2011

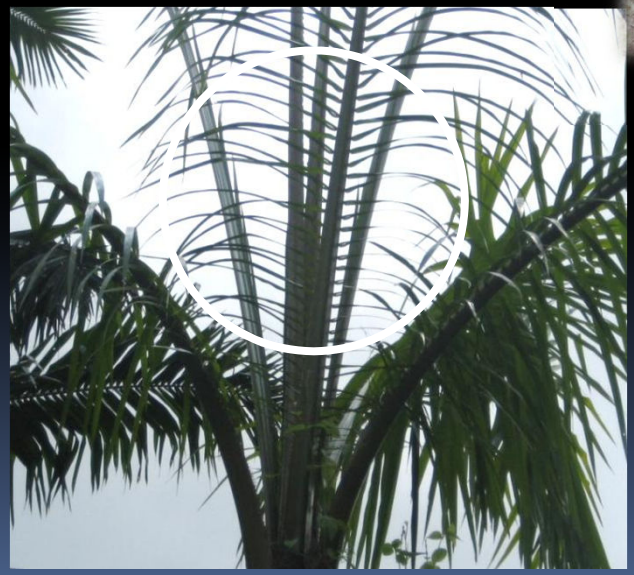
14 JULY 2011

18 AUGUST 2011

LADANG ELDRED BOUSTEAD

7 JULY 2011

2 AUGUST 2011



14 JULY 2011

18 AUGUST 2011

LADANG ELDRED BOUSTEAD

2 AUGUST 2011

18 AUGUST 2011

LADANG ELDRED BOUSTEAD

2 AUGUST 2011

18 AUGUST 2011

LADANG ELDRED BOUSTEAD

2 AUGUST 2011

18 AUGUST 2011

LADANG ELDRED BOUSTEAD

2 AUGUST 2011

GROWTH OF NEW FONDS

18 AUGUST 2011

LADANG ELDRED BOUSTEAD

2 AUGUST 2011

NEW HEALTHY FONDS

18 AUGUST 2011

OBSERVATION
(AFTER TREATMENT APPLICATION)

1.0) THE BASIDOCARP WERE ATTACKED BY THE MICROBIAL ENZYME AND MICROBES. (14 Aug 2011)

2.0) THE MICROBES WERE ATTACKING THE SPORES IN THE ROOT AREA, FORCING THE SPORES TO APPEAR AS NEW BASIDOCARP. (14 Aug 2011)

3.0) NEW GREEN VEGETATIVE GROWTH FOUND. (14 Aug 2011)

4.0) MANY NEW YOUNG ROOTS APPEAR. (14 Aug 2011)

5.0) NEW FONDS APPEAR ON THE TREE. (02 Aug 2011)

6.0) TREATED TREES LOOK HEALTHIER. (18 Aug 2011)

7.0) NO MORE FRUITING BODIES SEEN. (18 Aug 2011)

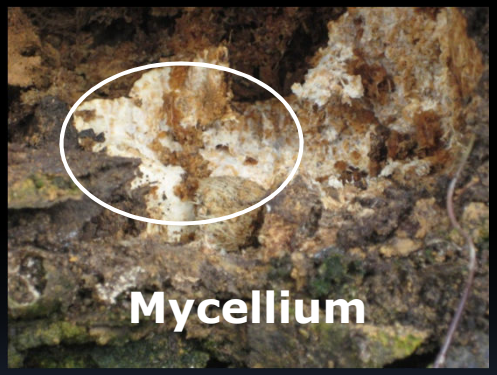
8.0) THE TREATED TREES WILL BE FURTHER OBSERVED FOR ANOTHER 4 – 6 MONTHS.

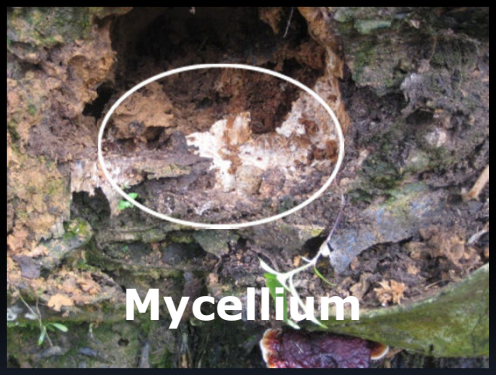
OBSERVATION FOR EVIDENCE OF NEW FRUITING BODIES

7 July 2011

2 August 2011

18 August 2011





26 September 2011

1 December 2011

OBSERVATION FOR EVIDENCE OF HEALTHY FRONDS

7 July 2011

18 August 2011

26 September 2011

1 December 2011

OBSERVATION FOR EVIDENCE OF NEW ROOTS

14 July 2011

26 September 2011

OBSERVATION FOR EVIDENCE OF FRUIT BUNCH

14 July 2011

2 August 2011

18 August 2011

26 September 2011

1 December 2011

SUMMARY ON 6TH MONTH OF OBSERVATION

1. There was no evidence of new fruiting bodies on 8 trees.
2. Evidence of small new fruiting bodies on 5 trees.
3. Healthy fronds observed on most trees with green and healthy spears.
4. New roots appearing on trees.
5. Infected trees continues to produce fruit bunches.
6. The trees under treatment generally looked healthy and are still continuing to produce fruit bunches.
7. The spread of infection on the trees have been arrested to a certain degree thereby prolonging the lifespan of the trees.
8. The trees which have been ear marked for mounding or replanting, are still standing and preventive treatment are ongoing.

Evaluation of Effective Microorganisms for *Ganoderma* Control in Oil Palm Seedlings

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Abstract

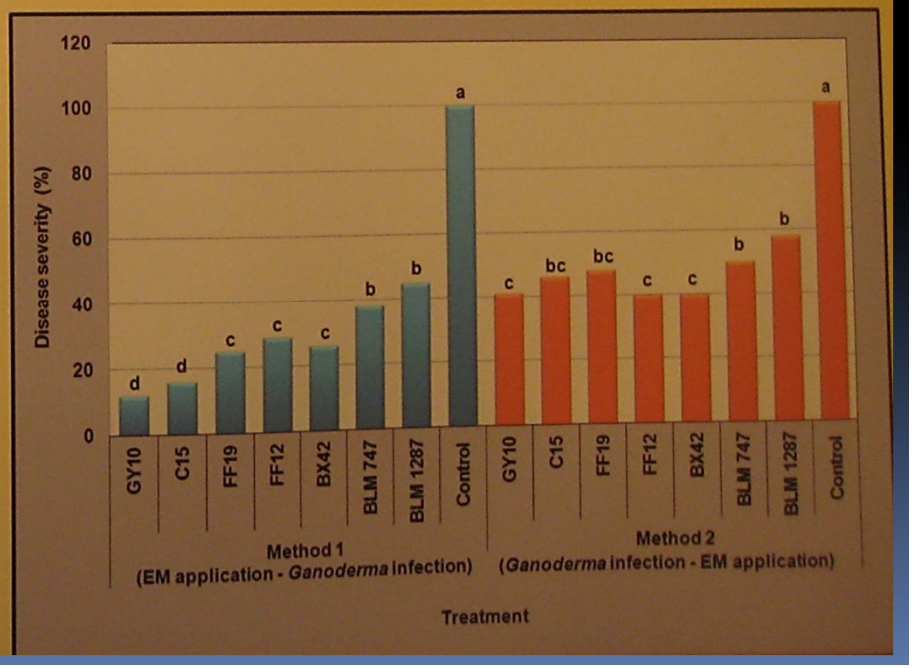
The effectiveness of seven isolates of selected effective microorganism (EM) viz. *Trichoderma spp.*(GY10, C15 and FF19), actinomycetes (FF12, BLM747 and BLM 1287) and bacteria *Pseudomonas aeruginosa* (BX42) was evaluated in nursery trial for the control of *Ganoderma boninense* infection in oil palm seedlings. 100g of EM product was applied using two different methods i.e. during the time of seed sowing and during transplanting to main nursery. The disease progression was assessed using the percentage of disease incidence (%DI) and percentage of disease severity (%DS). Trial result showed that *Ganoderma* disease developed much slower in seedlings treated with EM compared with untreated seedlings. Among the three groups of microorganisms tested, *Trichoderma spp.* was the most effective in controlling the disease with 43% to 85% reduction in *Ganoderma* incidence, followed by *Pseudomonas aeruginosa* with 50% to 65% and actinomycetes with 30% to 67% disease reduction, in comparison with untreated seedlings where there was 100% infection. All the EM treated seedlings also demonstrated lower disease severity with 12% to 48% for *Trichoderma spp.*, 26% to 40% for *Pseudomonas aeruginosa*, and 29% to 58% for actinomycetes in comparison with 100% disease severity for the control seedlings. In addition, the plant biomass of the EM treated seedlings for all EM treatments were significantly higher compared to the control.

Introduction

Ganoderma is a serious pathogen of oil palm. So far, there is no effective chemical control against the disease. Greater efforts are now directed towards possible biological control using antagonistic microorganisms.

Materials and Methods

- A prototype formulation has been developed. It contains about $3x10^6$ colony forming unit (CFU) of selected EM per 1g of carrier material.
- Nursery trial was laid out in complete randomized design (CRD) with 60 seedlings per treatment.
- Application rate was 100g of EM product per treatment; *Ganoderma* infection was by artificial inoculation using the standard protocol of *Ganoderma*-rubber wood block (RWB) inoculum (strain PER71).
- Two methods of EM application were tested *viz.* Method 1 (M1): application of EM at the time of seed sowing followed by *Ganoderma* infection at third month and Method 2 (M2): EM application after 3-months of *Ganoderma* infection.
- Disease development was evaluated based on quantitative assessment on the external symptoms measured as percentage of disease incidence (%DI) and assessment on the severity of the internal symptoms measured as percentage of disease severity (%DS).
- Seedling dried weights, i.e. root and shoot as well as the fresh against dried weight of the seedlings were measured to obtain the plant biomass measurements.




Dr Idris
(MPOB)
En. Nadzri
(Plantation
Manager)
Ladang Eldred
Applicators

CMS GanoEnz Treatment Cost / Hectare

Item	Description	Description	Description
Age of Tree	10 years old	15 years old	20 years old
Productive Years Left.	15 years	10 years	5 years
Yield (Assume)	20 tons / hec	20 tons / hec	20 tons / hec
Total yield over prod. years	300 tons / hec	200 tons/ hec	100 tons / hec
Total Income for Prod. years	**RM 650 x 300 t = RM195,000/hec**	**RM 650 x 200 t = RM 130,000/ hec**	**RM 650 x 100 = RM 65,000/hec**
Ave.Income /hec/year	**RM 13,000**	**RM 13,000**	**RM 13,000**

CMS GanoEnz Treatment Cost / Hectare

Item	Description	Description	Description
1st Year Treat+Prevent /hec/yr.	4 sprays (Treat) + 3 sprays (Prevent)	4 sprays (Treat) + 3 sprays (Prevent)	4 sprays (Treat) + 3 sprays (Prevent)
1styear Treat&Prevent /hec/yr	RM 450 x 18 Bt. = RM 8,100/hec	RM 450 x 18 Bt. = RM 8,100/hec	RM 450 x 18 Bt. = RM 8,100/hec
> 2nd year Prevent/hec/yr	RM 450 x 8 Bt. = RM 3,600/hec	RM 450 x 8 Bt. = RM 3,600/hec	RM 450 x 8 Bt. = RM 3,600/hec
Total App. Cost for Prod.Year/ hec	**RM 8,100 + RM 3600 x 14 yrs. = RM58,500/hec**	**RM 8,100 + RM 3600 x 9 yrs. =RM 40,500/hec**	**RM 8,100 + RM 3600 x 4 yrs. = RM 22,5000/hec**

CMS GanoEnz Treatment Cost / Hectare

Item	Description	Description	Description
Income for prod. Yrs.	RM 195,000 - RM 58,500 = RM 136,500 / hec.	RM 130,000 – RM 40,500 = RM 89,500 / hec.	RM 65,000 – RM 22,500 = RM 42,500 / hec.
Additional Income/yr./ hectare	**RM 9,100** /hec./yr 0r RM 65/tree/yr**	**RM8,900** /hec/yr or RM 63.6/tree/yr**	**RM8,500** /hec/yr or RM60.7/tree/yr**

NOTES:1) Assume Productive years for an Oil Palm Tree is 25 years.
2) One Hectare has 140 Trees.
3) Assume average yield is 20 ton/ hectare/year
4) Assume Current price of FFB / ton is RM 650. (2011)
5) For Treatment : 5 litres / spray (diluted), 4 sprays within 3 months.
Needs 12 bottles / hectare for treatment.
+ 6 bottles / hectare for prevention (remainder 9 mths.)

6) For Prevention: 5 litres / spray (diluted), 4 spray per year
(every 3 months), Needs bottles / hectare / year.
****7) For each replanted tree will cost about RM 70 or RM 9,800 / hectare.**
****8) Loss of production for 3 years, have not taken into consideration.**
****9) Increase in yield after treatment has not taken into consideration.**

Special Thanks to:-

1) Ladang Eldred Boustead

2) MPOB : Dr. Idris Abu Seman

3) UPM : Professor Dr. Sairah Meon

4) University of Florida: Md. Monica L. Elliot

5) PT Smart-CIRAD.UMR Fetis France.

6) Risda Agricultural Services

7) Lastly, to all those who were involved in this studies.

THANK YOU