



# GanoEF Biofertilizer



**ITEX** 13

MALAYSIA  
GOLD AWARD

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Oil palm dying from *Ganoderma* infection



# GanoEF

(Patent no : PI 2014701194)

4 in 1 Biofertilizer against  
*Ganoderma Basal Stem Rot* disease  
in oil palm

# More than 3.7% of oil palm planted in Malaysia have been reported with *Ganoderma Basal Stem Rot* disease

The devastating Basal Stem Rot ( BSR ) disease caused by *Ganoderma* fungus continues to be a major threat that prevents planters from achieving optimum yields from their oil palm cultivation. In Malaysia , 3.7% incidences of the disease have been reported with *Ganoderma* disease, which include those in Peninsular, Sabah and Sarawak.

Economic losses running into billions is expected if the disease is not controlled and dealt with.

The study of the disease using natural or cultivated organisms such as endophytic fungi started as early as 2000. The success of the application of these fungi to combat *Ganoderma* disease through *in vitro* and nursery trials have yielded positive results.

Until now, the industry has adopted the following measures to control the disease. However, these measures have not brought much relieve to the problem.

- Surgery and soil mounding
- Isolation trenching around infected palm
- Trunk injection of systemic fungicides
- Removal of diseased palm

'Research in microecology as an approach to certain plant-disease problems is by no means new but it has been much too long neglected, almost ignored, except by a chosen few. Those few, by their vision and their scholarly accomplishments through the years, have kept before us the great potentials of using microscopic living things to help solve problems that involve other living things.'

Dr Victor R. Boswell  
Ecology of Soil-Borne Plant Pathogens  
Prelude to Biological Control  
University of California Press, Berkeley, Los Angeles: 1965



## *Hendersonia*, an endophytic fungus has been tested to help in controlling and preventing the spread of *Ganoderma* Disease

*Hendersonia*, the endophytic fungus has been found to be strongly antagonistic against *Ganoderma boninense* in extensive laboratory studies. The eventual colonising of *Hendersonia* in plant tissues does no harm to the host plant. On the contrary, it helps to improve the oil palm's resistance against *Ganoderma Basal Stem Rot*.

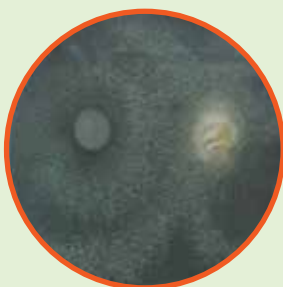
\* *Hendersonia* species is identified by CABI, UK



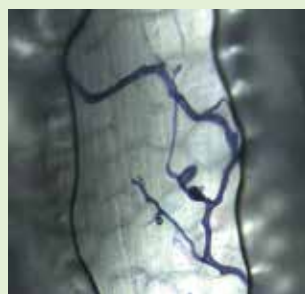
Pure culture of *Ganoderma*



Pure culture of *Hendersonia*



One week old dual-culture of *Ganoderma* and *Hendersonia*  
- note inhibition



Colonization of *Hendersonia* fungus  
in oil palm root

Test and Trial results :

- \* *Hendersonia* fungus is able to inhibit the growth of *Ganoderma boninense* *in vitro* test.
- \* GanoEF significantly reduces the infection of *Ganoderma boninense* on oil palm in nursery ( up to 70% ).
- \* GanoEF increases the vegetative growth of oil palm seedlings.
- \* GanoEF increases the lignin and enzyme activities such as peroxidase ( PO ), phenylalanine ammonia lyase ( PAL ), chitinase and glucanase in oil palm.



## GanoEF is a 4 in 1 Biofertilizer jointly developed by the Malaysian Palm Oil Board and All Cosmos Industries Sdn Bhd

GanoEF is a combination of *Hendersonia* (endophytic fungus), beneficial nutrients, organic matters and effective microorganisms ( EM ).

GanoEF containing *Hendersonia* has been patented and is ready for commercial production by June 2012. It is developed jointly by the Malaysian Palm Oil Board ( MPOB ) and All Cosmos Industries Sdn Bhd, a subsidiary of All Cosmos Bio-Tech Holding Corporation, the industry leader in bio-chemical fertilizers.

### Composition of the product :

- Mild N.P.K with trace elements
- *Hendersonia* fungus with population as colony-forming unit (CFU) per gram is min  $10^4$  CFU/g
- pH – 5.00–8.00
- Moisture – moisture content max 25%
- Organic Matters – min 30%
- C/N ratio – min 10

### 4 in 1 Components in GanoEF

#### Organic Matters

Provision of organic supplements to beneficial microorganisms for improvement to soil nutrient and water retention capacity

#### Chemical Nutrients

Provision of 17 macronutrients and micronutrients for optimum growth and yield

#### *Hendersonia* + Chitin ( Co-active Agents )

Endophytic *Ganoderma* biocontrol agent and plant phytoalexin inducer to prevent *Basal Stem Rot* disease

#### Effective Microorganisms

Improve soil biodiversity and supplement plant nutrition through N-fixing, P-solubilizing and growth factor production

### Effect of GanoEF Biofertilizer on *Ganoderma Basal Stem Rot* ( BSR ) disease development in oil palm seedlings ( Idris *et al.*, 2012 )

Treatment	Disease Development ( % )		Disease Reduction ( % )
	Disease Incidences ( DI )*	Dead seedlings*	
Untreated seedlings inoculated with <i>Ganoderma boninense</i> ( control, T1)	93.3a	86.7a	69.5%
Seedlings treated with GanoEF Biofertilizer and inoculated with <i>Ganoderma boninense</i> ( control, T2)	46.7b	26.7b	

Note: \*Columns with the same letter indicates no significant differences at  $p < 0.05$  using Least Significant Difference (LSD).

### Field Testing - Effects of GanoEF Biofertilizer in Controlling *Ganoderma Disease* in fields planted with oil palm

Treatment	Dead seedlings*
Untreated Seedlings	23.3%
Seedlings treated with GanoEF Biofertilizer	0%

### Recommended application - Nursery :

Age of palm	Rate (gm) per palm	Application
Month 4	50	Subsoil placement / cover with soil
Month 7	50	
Month 10	50	

#### Planting :

500 gm per planting hole.

#### Immature palm (< 4 years) :

2kg / palm / year

#### Mature palm (> 4 years) :

4kg / palm / year

#### Direction of use :

Product must be in contact with roots and must be covered with soil after application ( sub-soil placement ).

#### Product handling guideline :

Store in cool and dry place. Avoid direct sunlight. Product might start to form white spots after sometime, but will not harm nutrient content and product quality. Wash hands after use. Use all product within 12 months of manufacturing date.



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