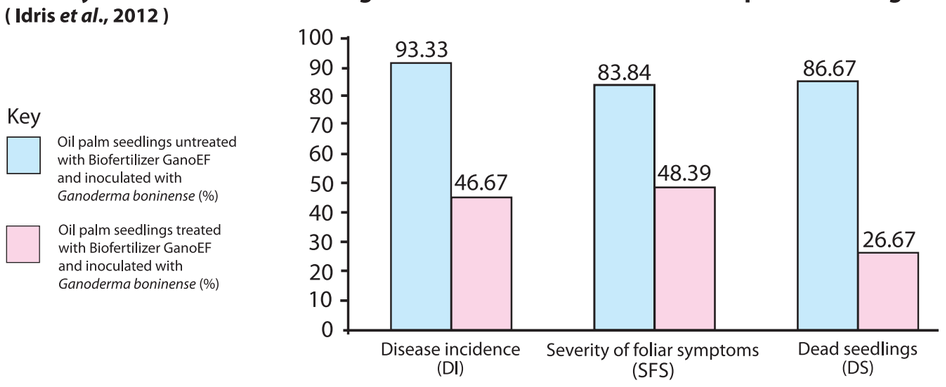
Nursery evaluation of GanoEF against *Ganoderma* infection on oil palm seedlings
(Idris *et al.*, 2012)



Effect of Biofertilizer GanoEF on *Ganoderma Basal Stem Rot* development in oil palm seedlings at 6 months after treatment

Treatment	AUDPC#	DR## (%)	Treatment	AUDPC#	DR## (%)
Seedlings untreated with Biofertilizer GanoEF and inoculated with *Ganoderma boninense* (as control)	273.33	-	Seedlings treated with Biofertilizer GanoEF and inoculated with *Ganoderma boninense*	83.33	69.51

Note : # Area Under Disease Progress Curve (AUDPC). ## Disease Reduction (DR)

Recommended application - Nursery :

Age of palm	Rate (gm) per palm	Application
Month 3	30	Subsoil placement / cover with soil
Month 9	30	

Planting :
500 gm per planting hole.

Young palm (< 5 years) :
2kg / palm / year for 3 consecutive years.

Mature palm (> 5 years) :
3kg – 4kg / palm / year for 3 consecutive years.

Direction of use :
Product must be in contact with roots and must be covered with soil after application.

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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RealStrong®

GanoEF Biofertilizer

GanoEF 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 to have been infected 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 , 3.71% incidences of the disease have been reported, 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

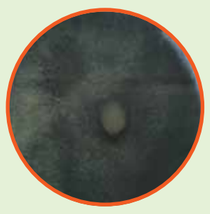
'Research in microecology as an approach to certain plant-disease problems is by no means new but it has been much too long neglected, almost ignored, except by a chosen few. Those few, by their vision and their scholarly accomplishments through the years, have kept before us the great potentials of 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 Basal Stem Rot*

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*.

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 10^6 $CFUg^{-1}$
- pH – 6.1–7.0
- Moisture – max 22%
- Organic Matters – min 50%
- Humic Acid – min 2%
- C/N ratio – min 15
- Bioactive enzymes

4 in 1 Components in GanoEF