

THE BLACK STUFF

Natural Organic Humate | Trial Report

LAO TR1 SUGAR BANANA TRIAL

Fusarium Wilt TR1 Disease Resistance | Thongmang, Lao PDR 2019–2020

March 2019 – December 2019 | TBS-TR-LAO-TR1-2019

1. TRIAL OVERVIEW

Trial Reference	TBS-TR-LAO-TR1-2019
Location	Thongmang Village (Ban Thong Mang), Xaythany District, Vientiane Prefecture, Lao PDR
Grower / Village	Ban Thong Mang community grower
Crop	Sugar Banana — Pak Song variety (<i>Musa acuminata</i>)
Disease Pressure	Panama TR1 (Race 1) — <i>Fusarium oxysporum</i> f.sp. <i>cubense</i>
Soil Type	Sandy loam
Soil pH	4.5
Annual Rainfall	Approx. 2,200 mm
Trial Duration	March 2019 – December 2019 (9 months continuous growth monitoring)
Supervising Agronomist	Khonesavanh Chittarhat, Plant Protection Center, Lao PDR
Farm Area	50 hectares — verified TR1-affected site

2. BACKGROUND — PANAMA TR1 DISEASE

Panama disease Race 1 (TR1) is caused by *Fusarium oxysporum* f.sp. *cubense* Race 1. While TR4 targets Cavendish varieties, TR1 is the primary disease pressure on older commercial varieties including Gros Michel and a range of South-East Asian sugar banana cultivars including the Pak Song variety grown at this site.

The 50-hectare Thongmang farm was independently verified by the Plant Protection Center (PPC) as 100% TR1-affected. The entire plant population showed disease symptoms and the grower had been advised that commercially viable production was no longer possible on the site.

The trial was established to test the efficacy of TBS at three application rates (1, 2 and 3 T/ha equivalents) against TR1 disease pressure, with an untreated control providing the baseline outcome for the same soil and pathogen load. Monthly growth measurements were taken over a nine-month period to establish a rigorous longitudinal dataset.

3. TRIAL DESIGN & METHODOLOGY

Treatment	TBS Rate	Area	NPK Fertiliser	Monthly Monitoring
T1 (High)	3 T/ha	Designated plot	NPK 15:15:15 @ 150 g/plant monthly	Height + circumference
T2 (Mid)	2 T/ha	Designated plot	NPK 15:15:15 @ 150 g/plant monthly	Height + circumference
T3 (Low)	1 T/ha	Designated plot	NPK 15:15:15 @ 150 g/plant monthly	Height + circumference
T4 Control	Nil	Adjacent plot	NPK 15:15:15 @ 150 g/plant monthly	Height + circumference

A once only TBS was applied as a dry granular product prior to planting, incorporated into the root zone. NPK 15:15:15 fertiliser at 150 g per plant was applied monthly to all four treatments, including the control. This ensured that observed differences in performance were attributable to TBS, not to differences in NPK input.

Plant height (cm) and pseudostem circumference (cm) were measured monthly for each treatment by the supervising agronomist from the Plant Protection Center. Measurements were recorded and compiled into a formal trial register.

4. SITE PHOTOGRAPHS — ESTABLISHMENT (MARCH 2019)

The following photographs document site conditions at establishment, including the TR1 disease environment and the formal trial agreement process between The Black Stuff, the village head and the supervising agronomist.



Trial agreement ceremony — Ban Thong Mang village head, March 2019



Signing of trial protocol — supervising agronomist and village representative



TR1-affected sugar banana surrounding trial plot at establishment



Widespread TR1 disease across site — all plants symptomatic prior to TBS application



Site set-up at planting, March 2019 — TBS being applied to root zone



Overview of trial plot area showing surrounding TR1 pressure



Thongmang Selected Site — aerial/map view showing trial plot layout, April 2019

5. MONTHLY GROWTH DATA — HEIGHT (CM)

Month	T1 — 3T/ha	T2 — 2T/ha	T3 — 1T/ha	T4 Control
Month 1	22	20	18	15
Month 2	38	34	30	22
Month 3	58	52	46	28
Month 4	80	72	63	29
Month 5	104	93	81	24
Month 6	128	113	98	18
Month 7	152	133	114	10
Month 8	170	151	130	5
Month 9	187	167	144	DEAD

6. MONTHLY GROWTH DATA — CIRCUMFERENCE (CM)

Month	T1 — 3T/ha	T2 — 2T/ha	T3 — 1T/ha	T4 Control
Month 1	5.0	4.5	4.0	3.5
Month 2	9.5	8.5	7.5	5.0
Month 3	15	13	11	6.0
Month 4	22	19	16	6.5
Month 5	28	25	21	5.0
Month 6	35	30	26	3.5
Month 7	42	36	31	2.0
Month 8	47	42	37	1.0
Month 9	50	45	40	DEAD

KEY RESULT — 9 MONTHS: At 9 months, T1 (3 T/ha) plants reached 187 cm height and 50 cm circumference — commercially viable banana plants on TR1-affected soil. ALL control plants (T4) were dead by Month 9.

7. SITE PHOTOGRAPHS — NOVEMBER 2019 (9 MONTHS)



November 2019 — Control plot (T4): ALL banana plants dead at 9 months



November 2019 — Test Area 1 (T1, 3 T/ha TBS): Vigorous healthy plants at 9 months

8. CONCLUSIONS

The Thongmang TR1 sugar banana trial provides conclusive field-scale evidence of TBS efficacy against Panama Race 1 disease:

- (a) All three TBS application rates (1, 2 and 3 T/ha) sustained commercially viable banana plant growth across the full 9-month trial on verified TR1-affected soil.
- (b) The untreated control, receiving the same NPK programme, declined progressively from Month 4 and lost all plants by Month 9.
- (c) The optimum TBS application rate was 3 T/ha (T1), yielding 187 cm plant height and 50 cm circumference at 9 months.
- (d) The month-by-month growth data (available in the formal trial register) provides a longitudinal dataset of exceptional scientific value for understanding TBS mode of action in TR1-suppression.
- (e) The trial was suspended prior to completion due to COVID-19 lockdowns in Lao PDR. The 9-month dataset presented represents the final recorded measurements prior to suspension.

9. CONTACT & FURTHER INFORMATION

Company	The Black Stuff Pty Ltd
Website	theblackstuff.com.au
Contact	info@theblackstuff.com.au 1300 082 011
Full Report	2020 Lao PDR TR1 Trial Summary and Trial Register on file