THE OUTBREAK OF SOOTY MOLD AND MEALYBUG IN SABAH OIL PALM PLANTATIONS

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OUTLINE

SPREAD:

SOOTY MOLD AND MEALYBUG OUTBREAKS IN TAWAU REGION

INTRODUCTION:

WHAT IS SOOTY MOLD AND MEALYBUG?

IMPACT:

EFFECT OF SOOTY MOLD ON PHOTOSYNTHETIC ACTIVITY

CONTROL:

CHEMICAL TREATMENTS

CONCLUSION AND FUTURE WORKS

SECTION 1: SPREAD

SOOTY MOLD & MEALYBUGS OUTBREAKS

KLK TAWAU ESTATE COMPLEX

8 ESTATES: 19,537 HA

First account of sooty mold in the Tawau region as reported by our agronomists

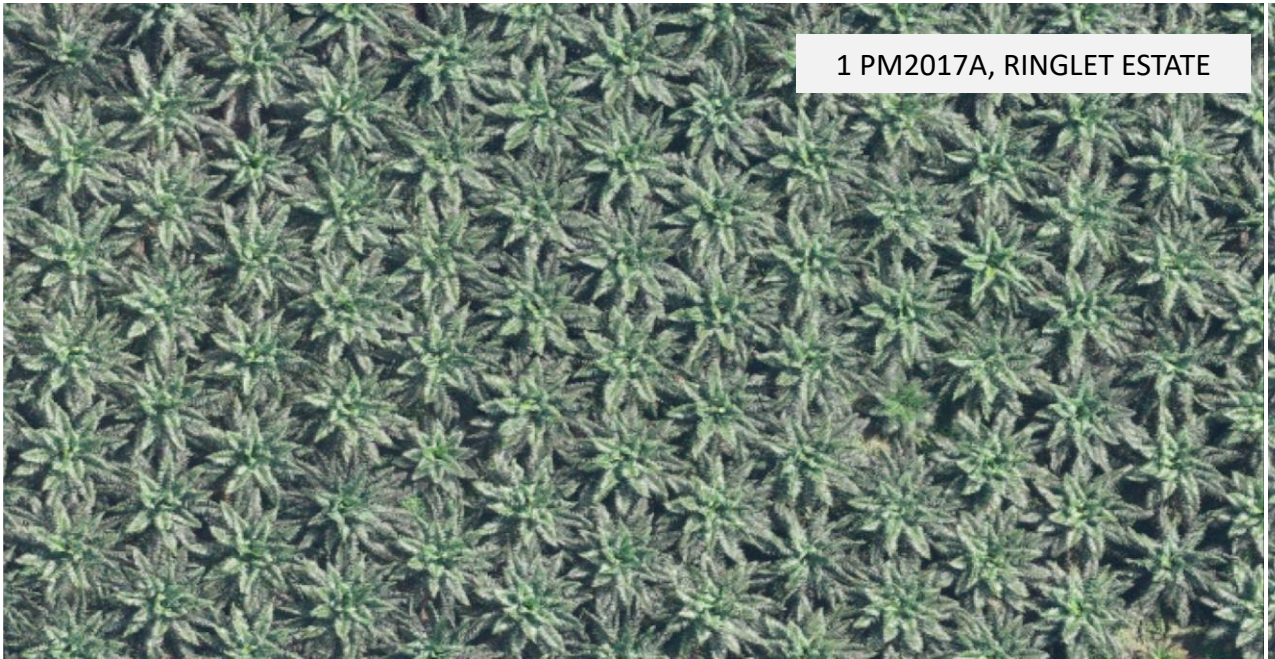
Sooty mold trial commenced

2017 | 2018 - 2021 | 2022

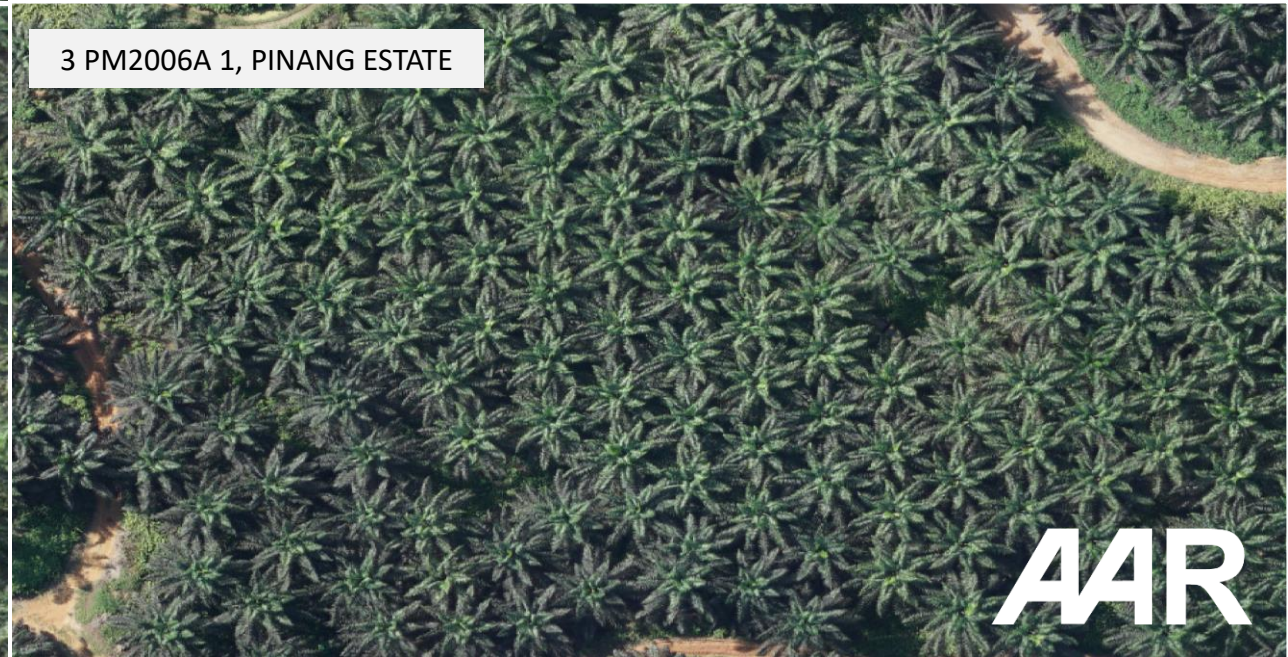
Yields continued to dwindle

DRONE IMAGE OF PANGERAN ESTATE IN 2017

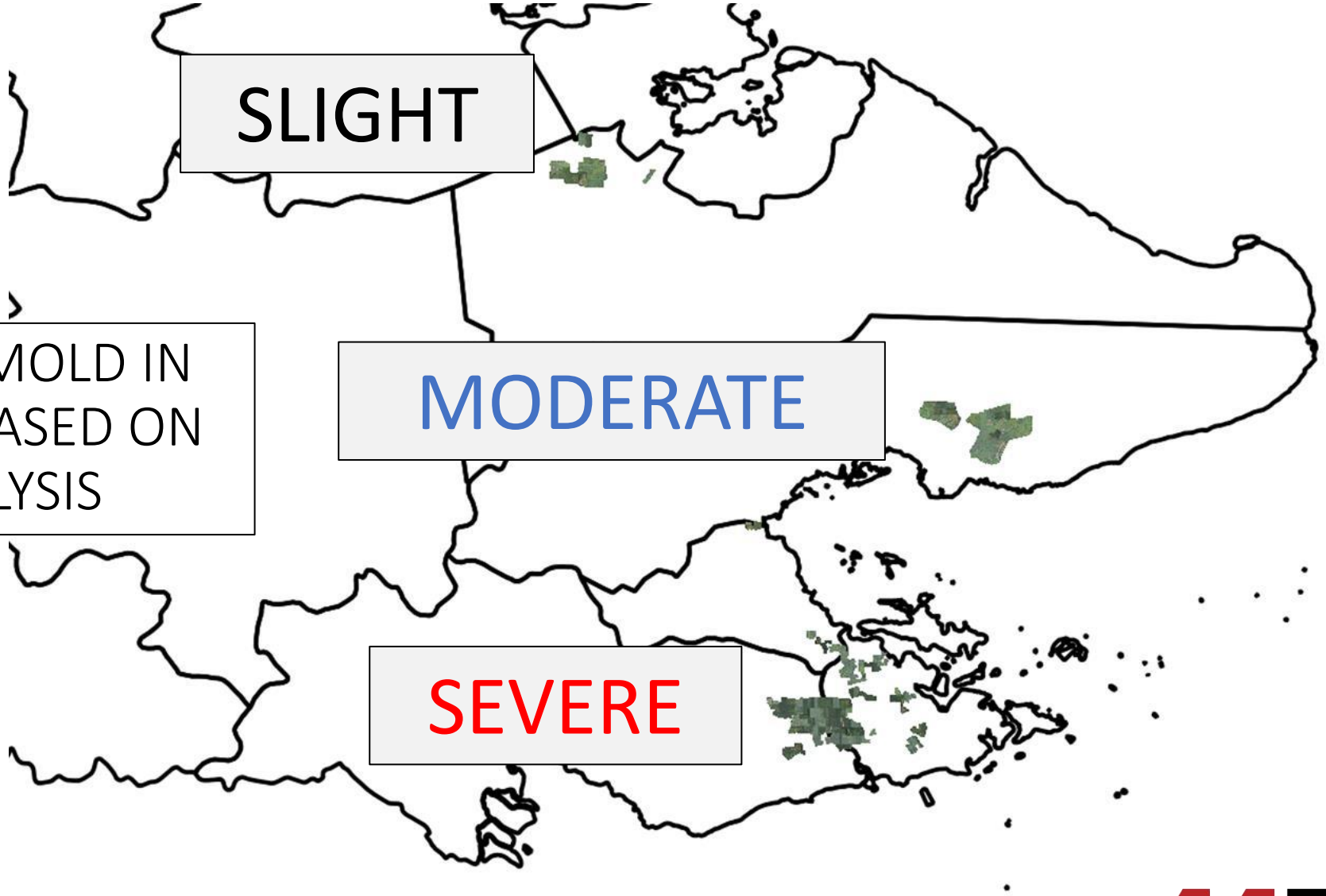
2022 DRONE IMAGES



2022 DRONE IMAGES



SEVERITY OF SOOTY MOLD IN KLK SABAH ESTATES BASED ON GEOSPATIAL ANALYSIS



SECTION 2: WHAT IS SOOTY MOLD & MEALYBUG?


Nipaecoccus nipae (COCONUT MEALYBUGS)
AAR


55X


AAR

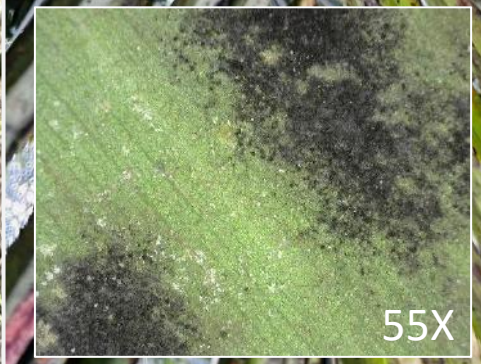
% OCCURRENCE: 71% ADAXIAL & 29% ABAXIAL

CRUSTY

% OCCURRENCE: 31.7% ADAXIAL & 22.6% ABAXIAL

PATCHY

% OCCURRENCE: 24.3% ADAXIAL & 45% ABAXIAL



VELVETY

% OCCURRENCE: 44% ADAXIAL & 32.3% ABAXIAL

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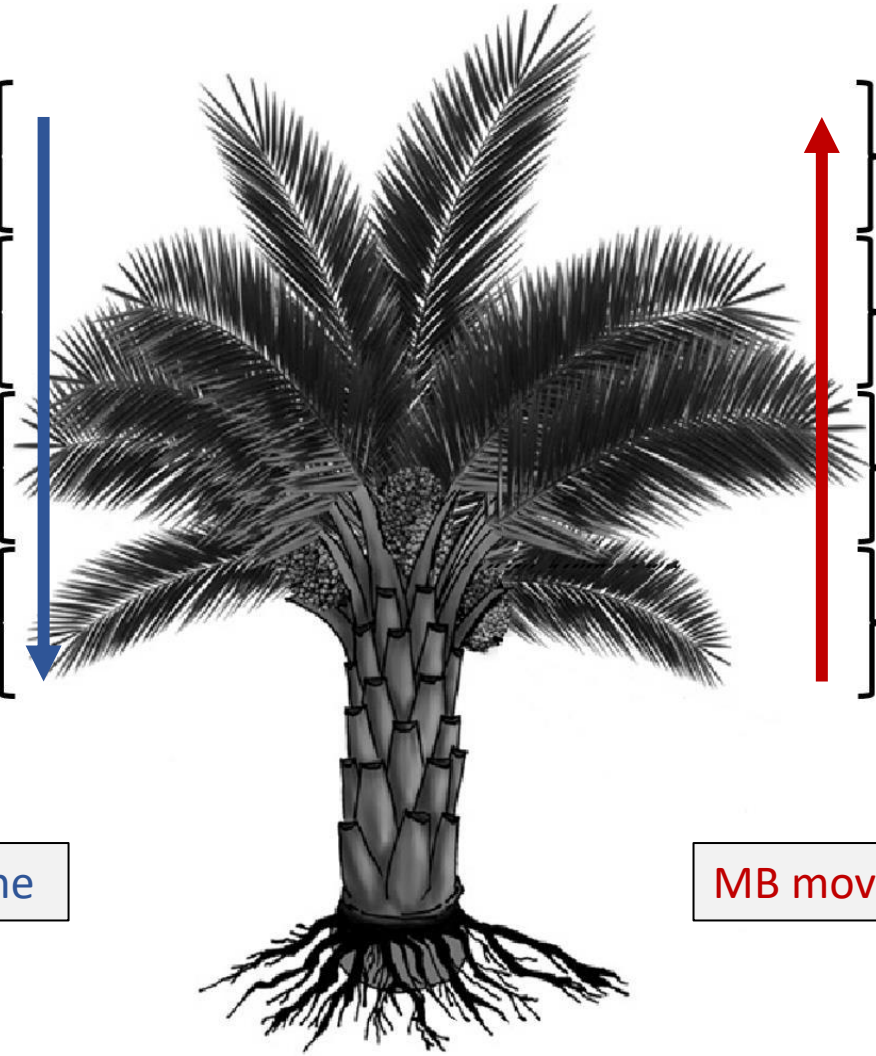
SOOTY MOLD & MEALYBUGS ACROSS THE CANOPY

SOOTY MOLD

- LEVEL 1 (Frond 1 – 16): **8%**
- LEVEL 2 (Frond 17 – 32): **30%**
- LEVEL 3 (Frond 33 – 41): **32%**
- LEVEL 4 (Frond > 41): **31%**



MEALYBUGS

- LEVEL 1 (Frond 1 – 16): **14%**
- LEVEL 2 (Frond 17 – 32): **53%**
- LEVEL 3 (Frond 33 – 41): **21%**
- LEVEL 4 (Frond > 41): **13%**

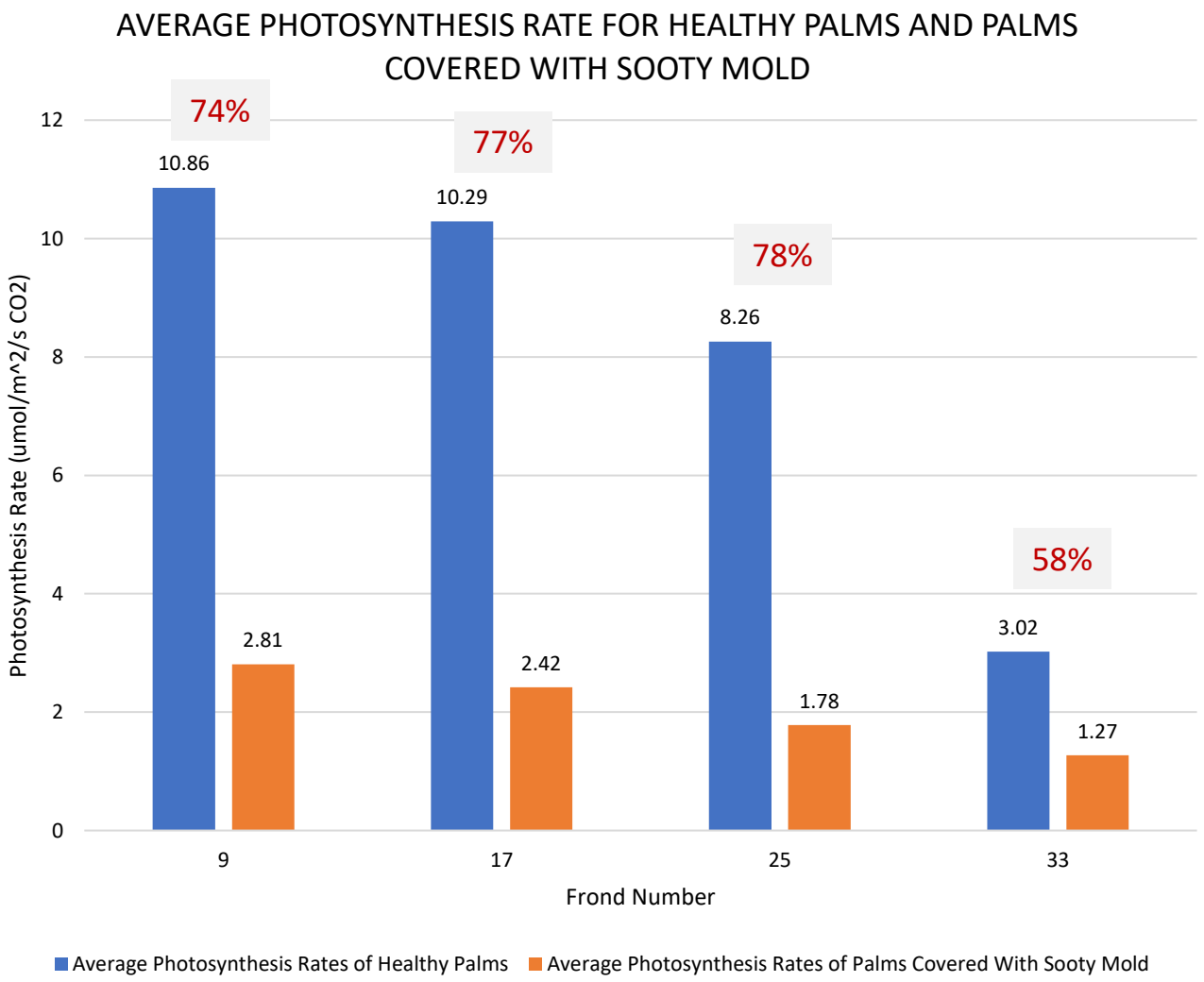
Sooty mold coverage on the adaxial surface was significantly affected by the number of mealybugs on the abaxial surface above it.

SM accumulates over time

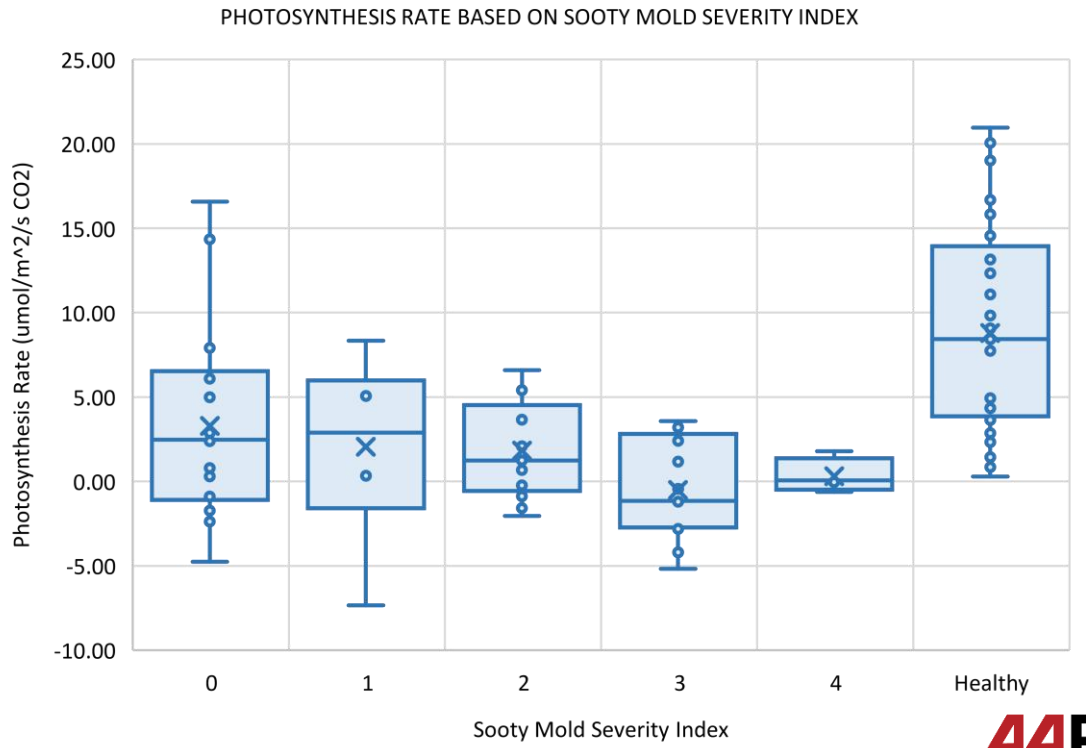
MB moves to the younger fronds

SECTION 3: IMPACTS OF SOOTY MOLD

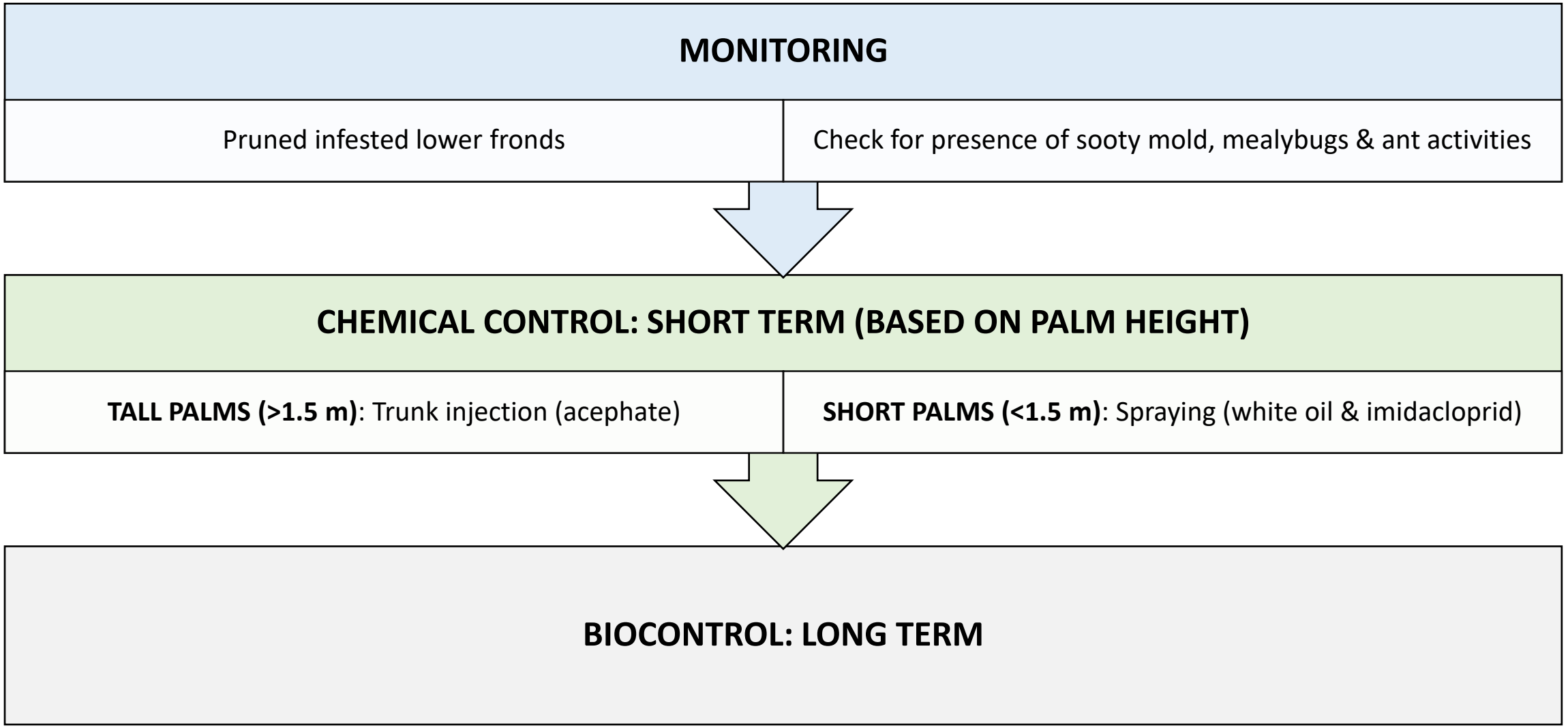
AGE	2 YEARS	TIME	8 AM – 4 PM



FROND	AVERAGE SOOTY MOLD COVER		AVERAGE NUMBER OF MEALYBUG/ PINNA
	SEVERITY INDEX	QUANTIFIED AREA (%)	
9	0.0	0.0	0.0
17	0.8	20.4	0.4
25	2.8	55.3	3.7
33	2.9	70.3	1.7

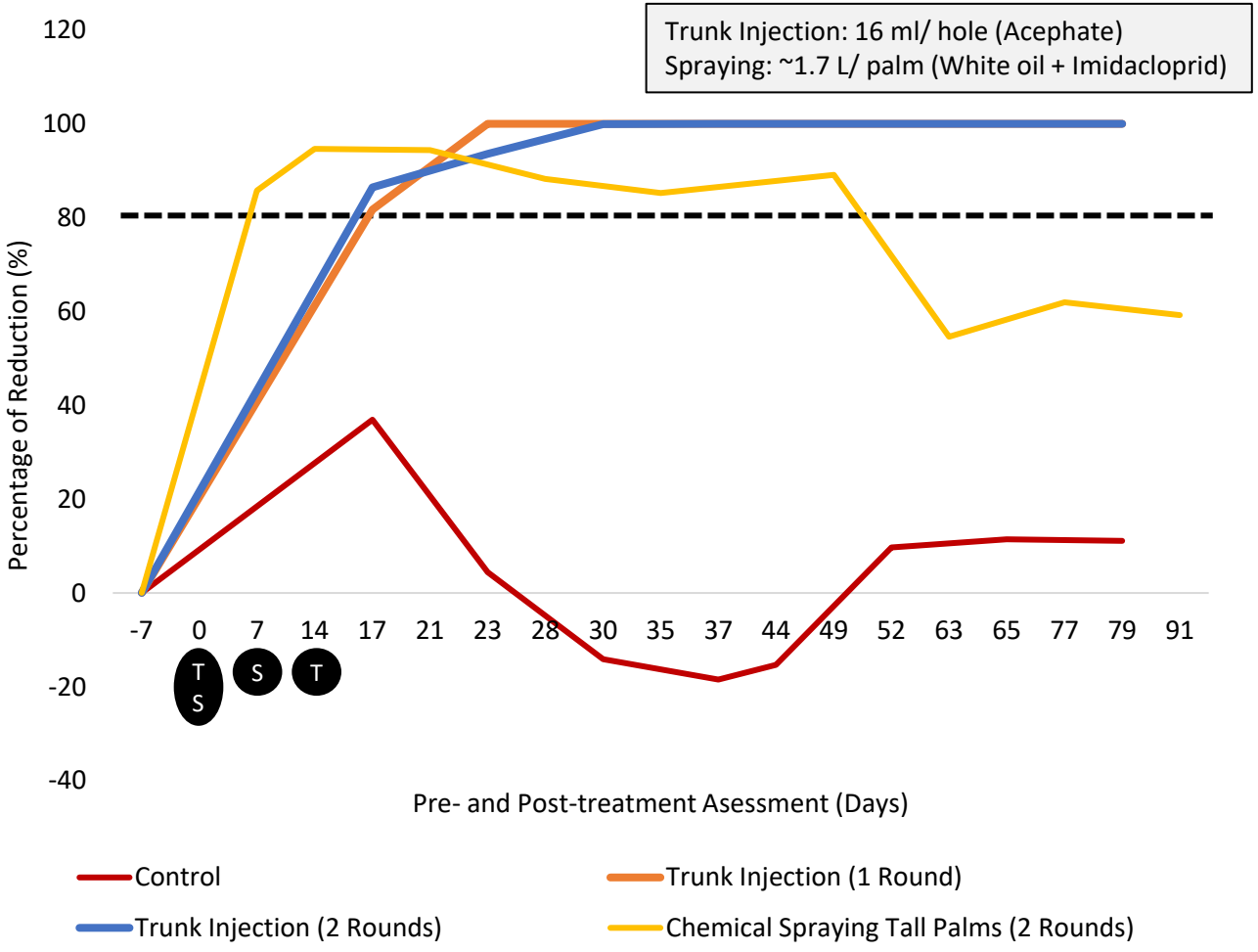


SECTION 4: PROPOSED CONTROL

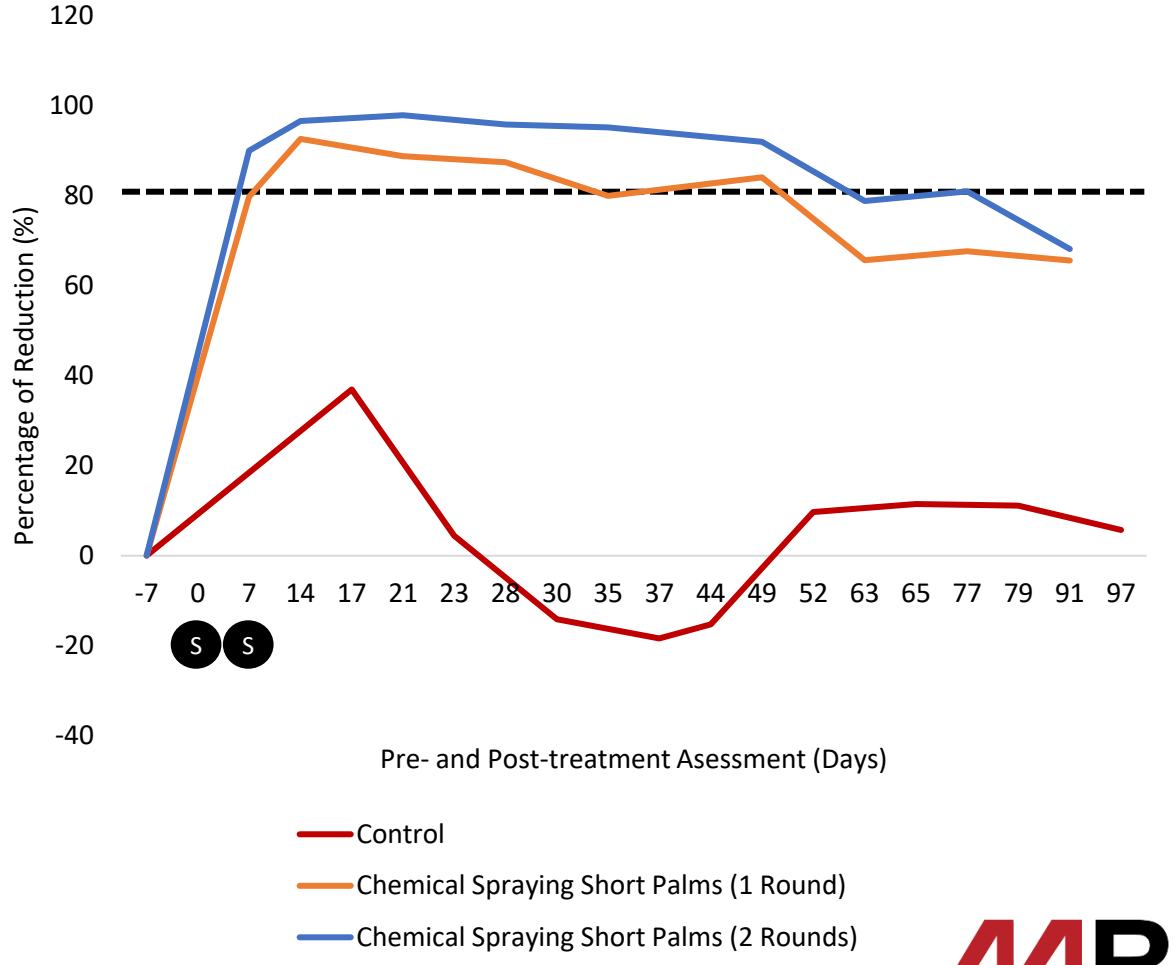


AVERAGE PERCENTAGE OF MEALYBUGS REDUCTION

TAll PALMS (>1.5 m): AVERAGE PERCENTAGE OF MEALYBUGS REDUCTION FOR CHEMICAL SPRAYING (WHITE OIL + IMIDACLOPRID) AND TRUNK INJECTION (ACEPHATE) TREATMENTS



SHORT PALMS (<1.5 m): AVERAGE PERCENTAGE OF MEALYBUGS REDUCTION FOR CHEMICAL SPRAYING (WHITE OIL + IMIDACLOPRID) TREATMENT

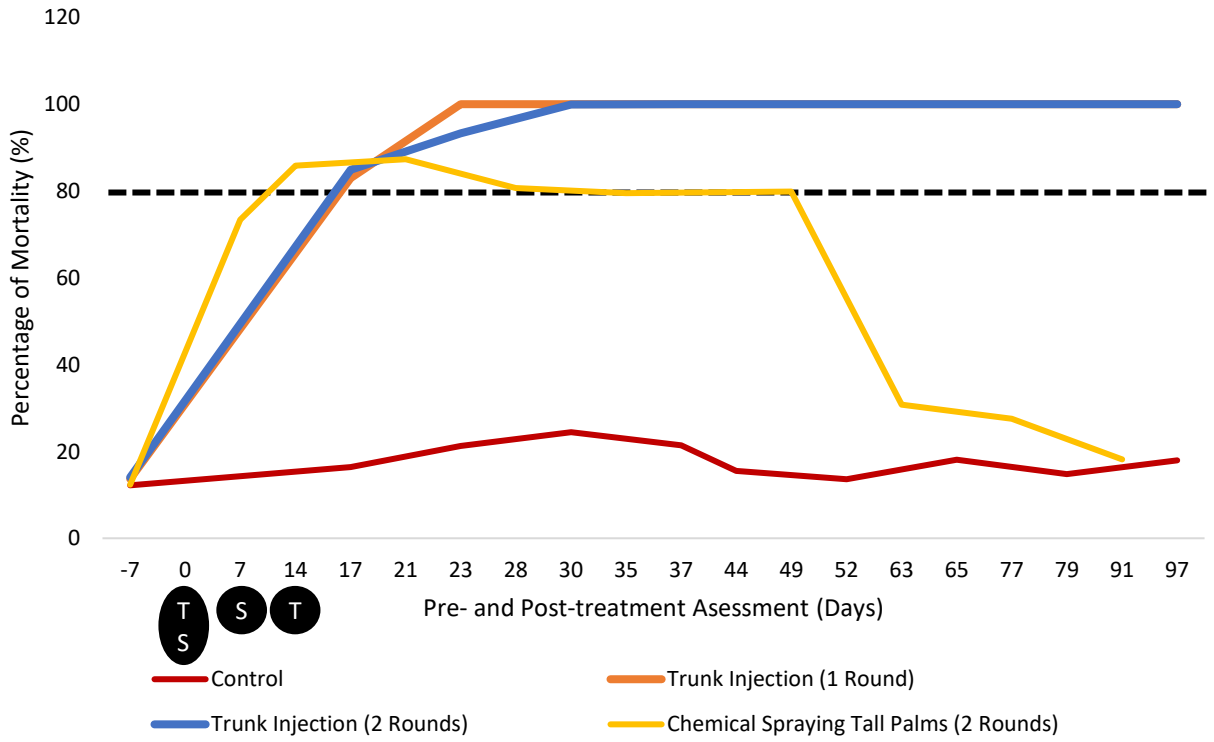


T TRUNK INJECTION TREATMENT ROUND

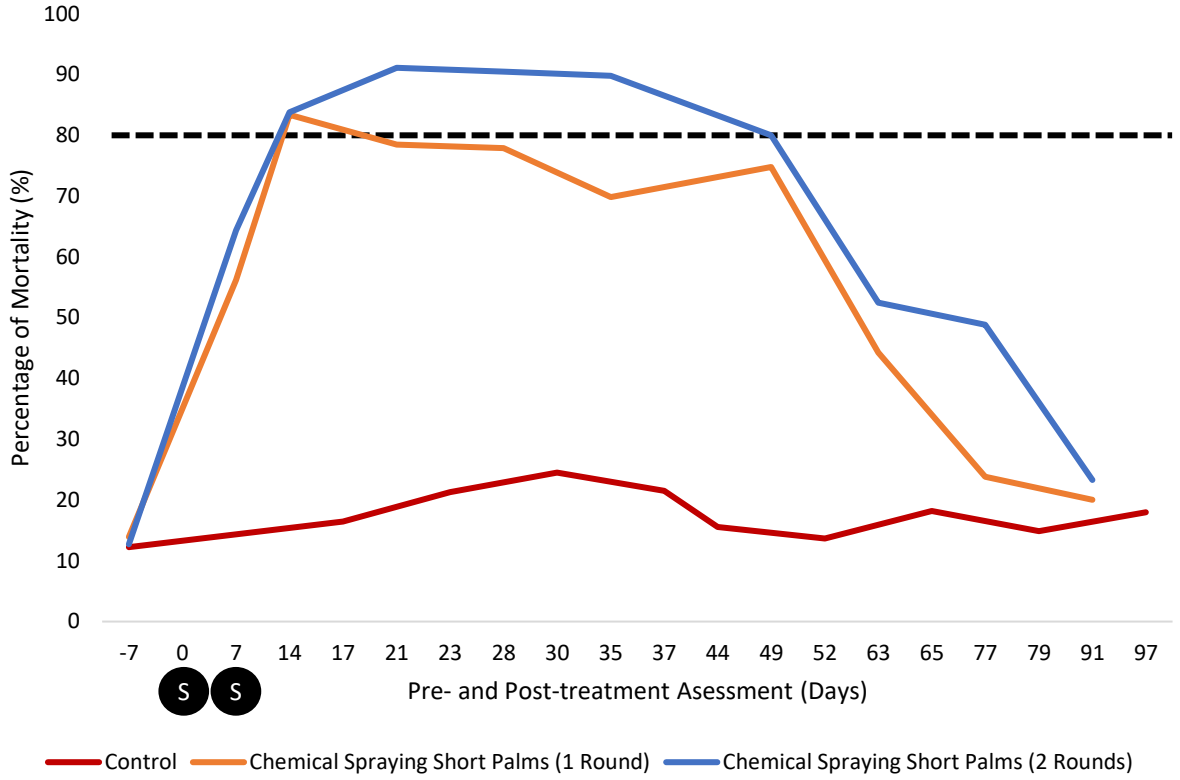
S SPRAYING TREATMENT ROUND

AVERAGE PERCENTAGE OF MEALYBUGS MORTALITY

TAll PALMS (>1.5 m): AVERAGE PERCENTAGE OF MEALYBUGS MORTALITY FOR CHEMICAL SPRAYING (WHITE OIL + IMIDACLOPRID) AND TRUNK INJECTION (ACEPHATE) TREATMENTS



SHORT PALMS (<1.5 m): AVERAGE PERCENTAGE OF MEALYBUGS MORTALITY FOR CHEMICAL SPRAYING (WHITE OIL + IMIDACLOPRID) TREATMENT



T TRUNK INJECTION TREATMENT ROUND

S SPRAYING TREATMENT ROUND

CONTROL DURATION (> 80% REDUCTION & MORTALITY)	
CHEMICAL SPRAYING: • TALL, 2 ROUNDS: **28 DAYS** • SHORT, 1 ROUND: **14 DAYS** • SHORT, 2 ROUNDS: **35 DAYS**	TRUNK INJECTION: • 1 ROUND: **129 DAYS** • 2 ROUNDS: **129 DAYS**

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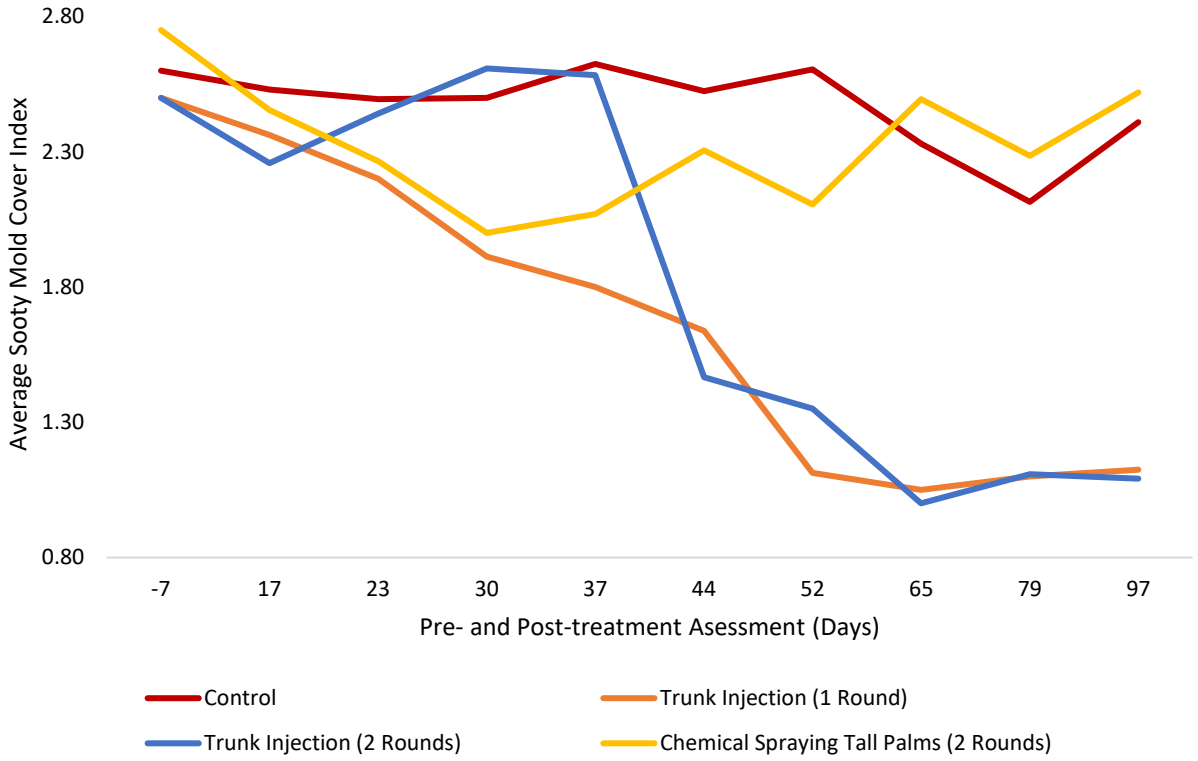
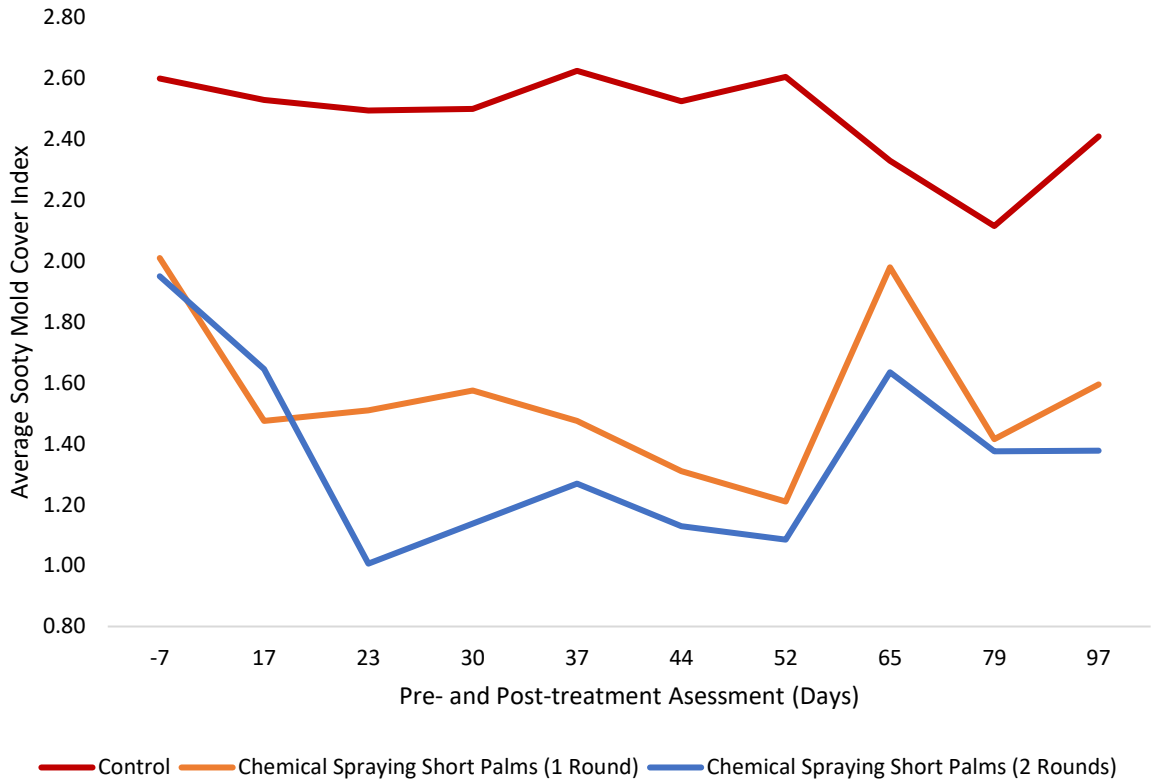
EFFECT OF TREATMENTS ON SOOTY MOLD

TALL PALMS (>1.5 m): AVERAGE SOOTY MOLD SEVERITY INDEX PER PINNA AFTER CHEMICAL SPRAYING (WHITE OIL + IMIDACLOPRID) AND TRUNK INJECTION (ACEPHATE)



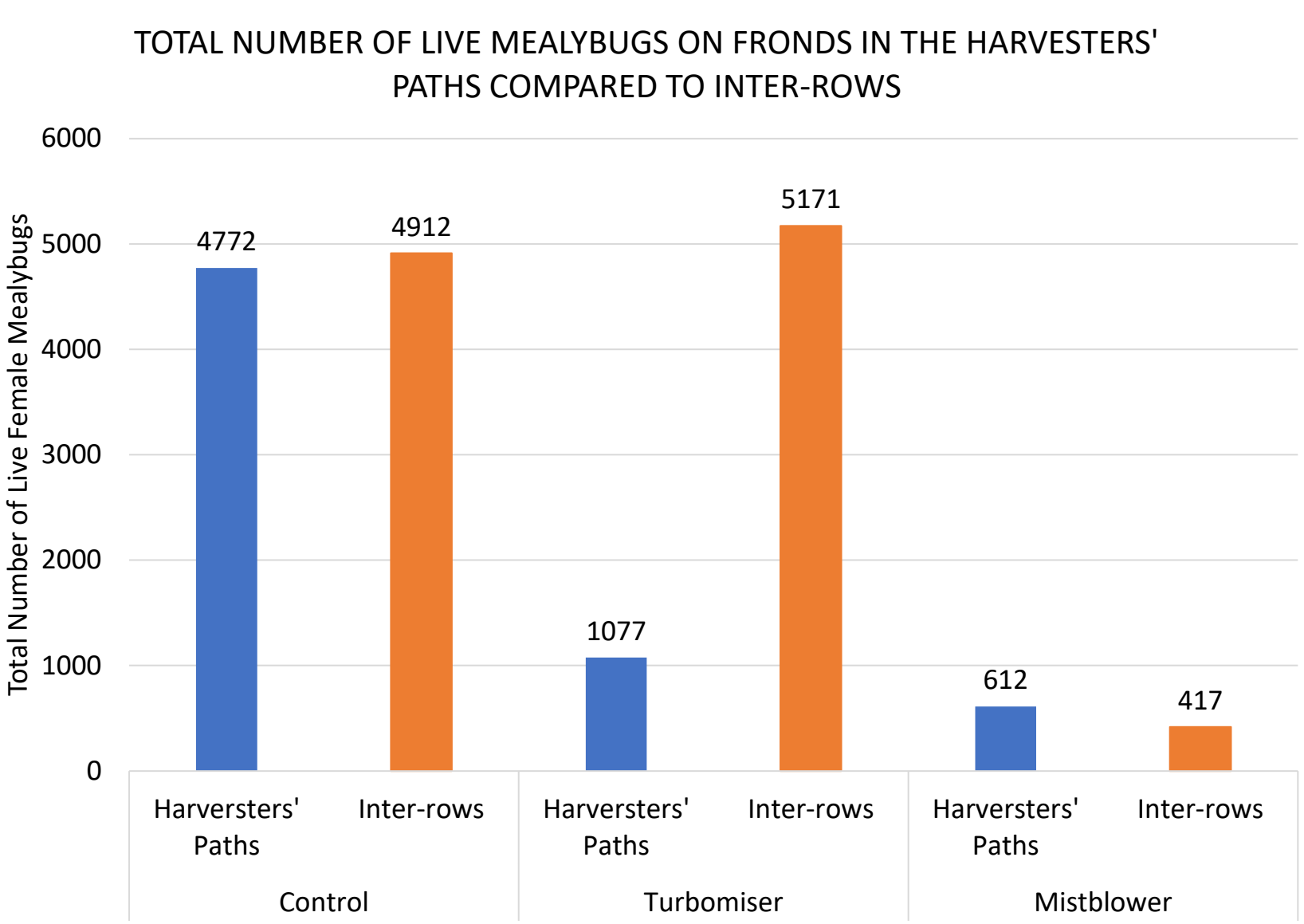
SHORT PALMS (>1.5 m): AVERAGE SOOTY MOLD SEVERITY INDEX PER PINNA AFTER CHEMICAL SPRAYING (WHITE OIL + IMIDACLOPRID)



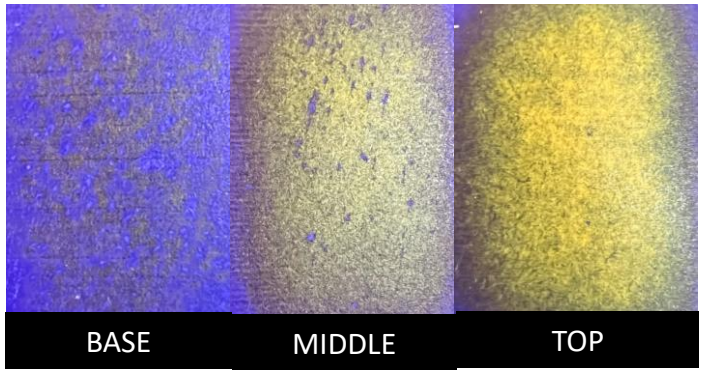
INDEX	SEVERITY CATEGORY
0	NIL
1	SLIGHT
2	MODERATE
3	SEVERE
4	VERY SEVERE


TRUNK INJECTION
CONTROL: 2 PM2010B
FROND 34
TREATMENT: 2 PM2010A
FROND 34

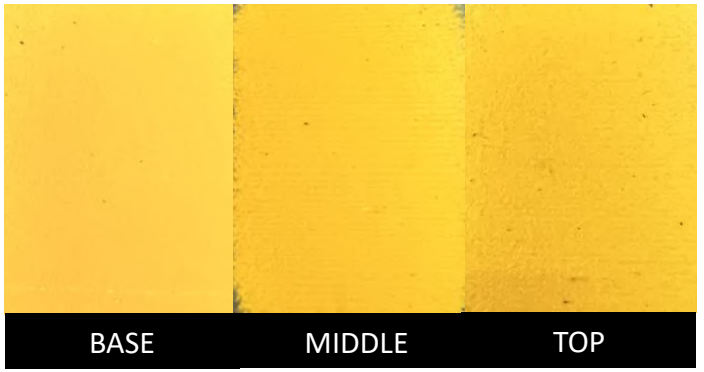
SPRAYING EFFICIENCY



FROND 24
HARVERSTERS' PATH

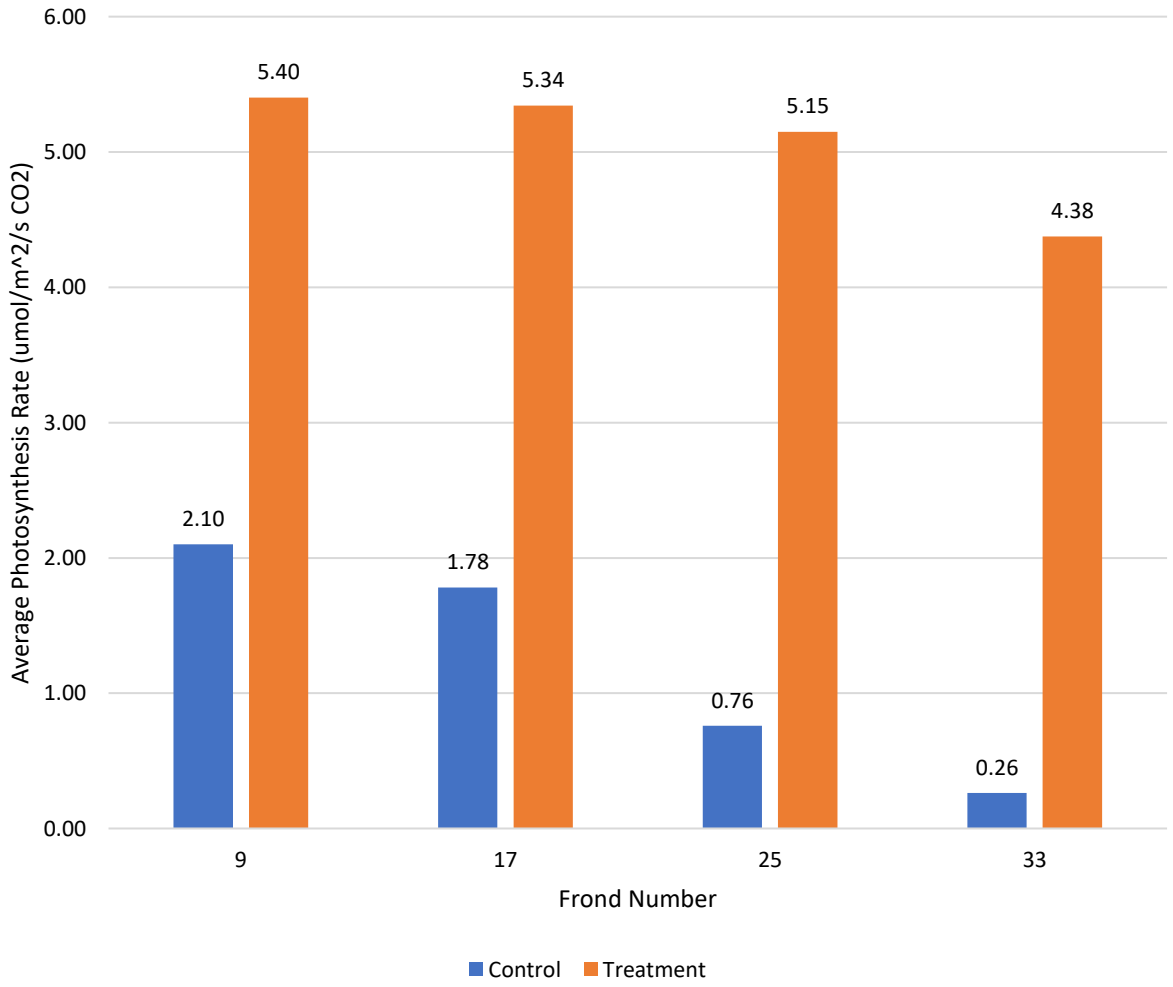


FROND 33
INTER-ROW



PHOTOSYNTHESIS RATES AFTER TREATMENT: TRUNK INJECTION

AVERAGE PHOTOSYNTHESIS RATES BETWEEN TREATED PALMS (WITH ACEPHATE) AND CONTROL PALMS 137 DAYS AFTER TREATMENT



AGE	13 YEARS	TIME	7 AM – 11 AM

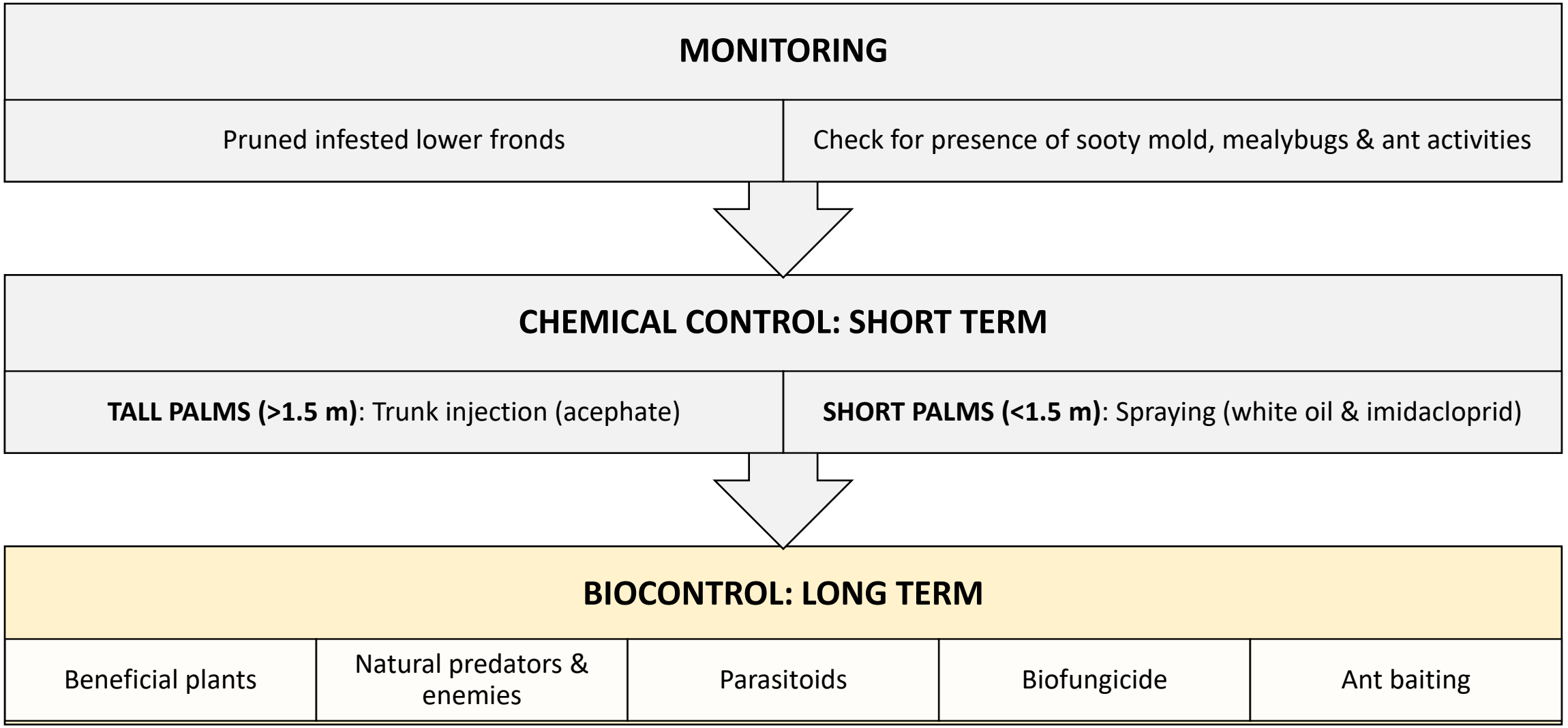
FROND	RANGE OF PHOTOSYNTHESIS RATE ($\mu mol\ m^{-2}s^{-1}\ CO_2$)					
	CONTROL			TREATED		
	MEAN	MIN	MAX	MEAN	MIN	MAX
9	**2.10**	0.81	3.57	**5.40**	0.37	9.93
17	**1.78**	1.02	2.72	**5.34**	3.57	8.29
25	**0.76**	-3.24	5.87	**5.15**	1.34	8.82
33	**0.26**	-1.86	4.00	**4.38**	3.93	6.72

FROND	% DIFFERENCE
9	**61**
17	**67**
25	**85**
33	**94**

CONCLUSION

- Sooty mold is **endemic** and **spreading** in Sabah.
- FFB yields are **declining**, corresponding with the **spread** of sooty mold.
- Sooty mold is **linked** to the outbreak of mealybugs.
- Photosynthesis rates have **dropped** between **58 – 78%**. However, the effect is **reversible** after treatments.
- These developments warrant **immediate interventive** measures such as:
  - **Palm height < 1.5 m**: Chemical spraying that can **control** the mealybug population for **up to 35 days**, depending on the number of **rounds** and palm **height**.
  - **Palm height >1.5 m**: Trunk injection using acephate that can **break** the life cycle and completely **suppress** the mealybug population for **> 4 months**.

FUTURE WORKS



ACKNOWLEDGMENT

A special appreciation to **MPOB (Malaysian Palm Oil Board)** for their swift assistance in our acephate permit application and for spreading awareness about sooty mold and mealybugs. Your support and guidance have been crucial in tackling this issue in Sabah. I also want to convey my deepest gratitude to **DOA Sabah (Department of Agriculture, Sabah)** and the **Pesticide Board (Sabah and Federal)** for their commitment throughout our acephate permit application process. AAR is currently working with G-Planter to re-label acephate product for mealybugs treatment. The treatment timeline and SOPs are currently being compiled and will be endorsed by MPOB and Pesticide Board. This includes the collection of soil, water, and CPO samples for acephate residue monitoring before and after treatments. All relevant data will be submitted to MPOB and DOA Sabah as pre-requisite requirements for permit application. To our principals, **KLK** and **Boustead Plantations**, thank you for your funding and encouragement. I also thank my colleagues for their unwavering support and dedication throughout this project. This project would not have been possible without the contributions and collaboration of all the mentioned parties.

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