STATUS REPORT OF BIOLOGICAL CONTROL ON RED PALM *MITE(RAOIELLA INDICA*.

DEVELOPMENT OF THE COCONUT INDUSTRYIN THE CARIBBEAN (CARDI/CTA)

7 – 8TH OCTOBER. 2013
Guyana International Conference Centre (GICC).
Guyana

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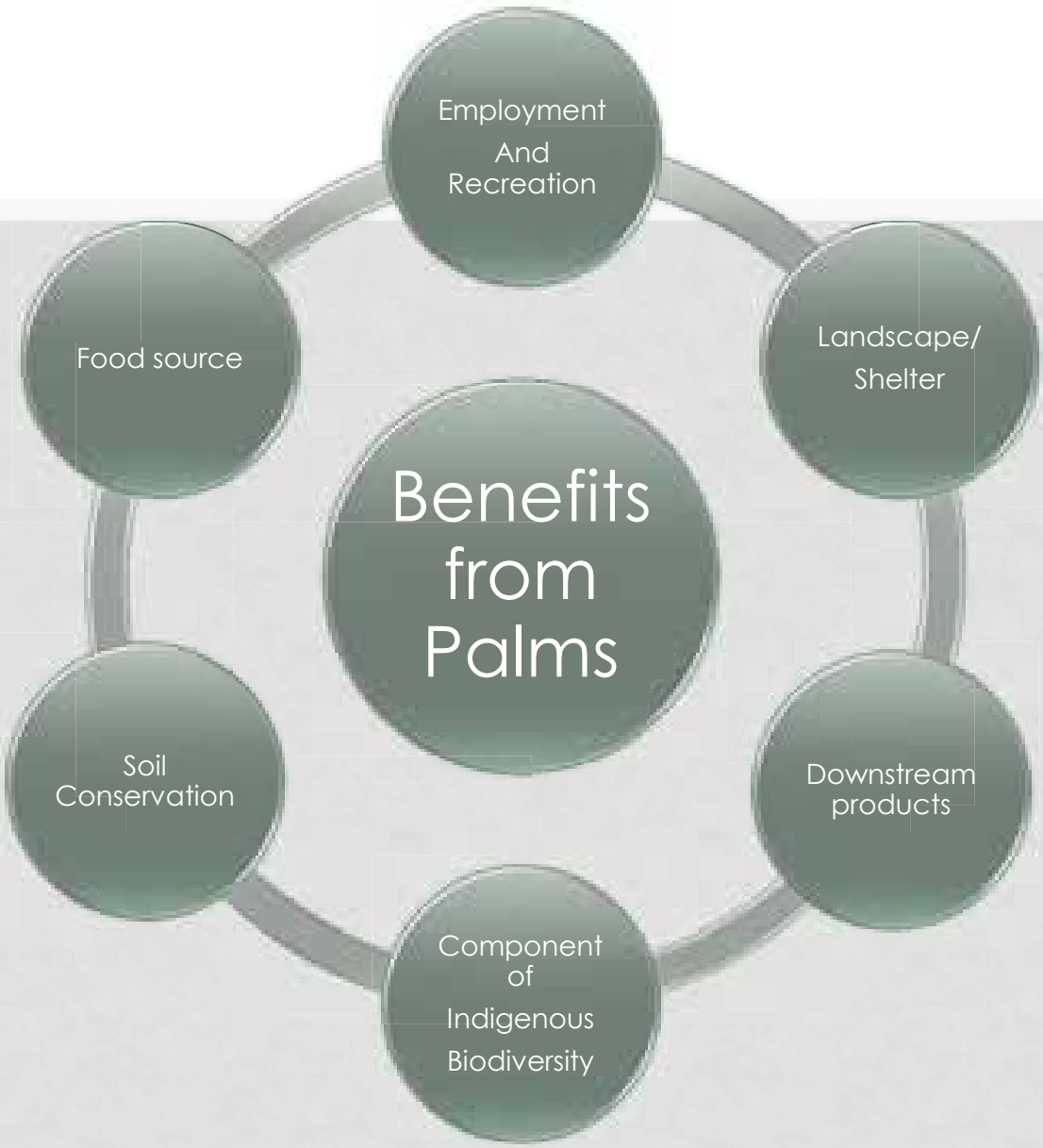
OUTLINE

- Impact of RPM on the Coconut Industry
- Pest Management Options
- Importance of Natural Enemies on the Management of RPM
- Bio-prospecting and Assessment of RPM
- Video –Natural Predators on RPM in Trinidad &Tobago
- Conclusion
- The Way Forward

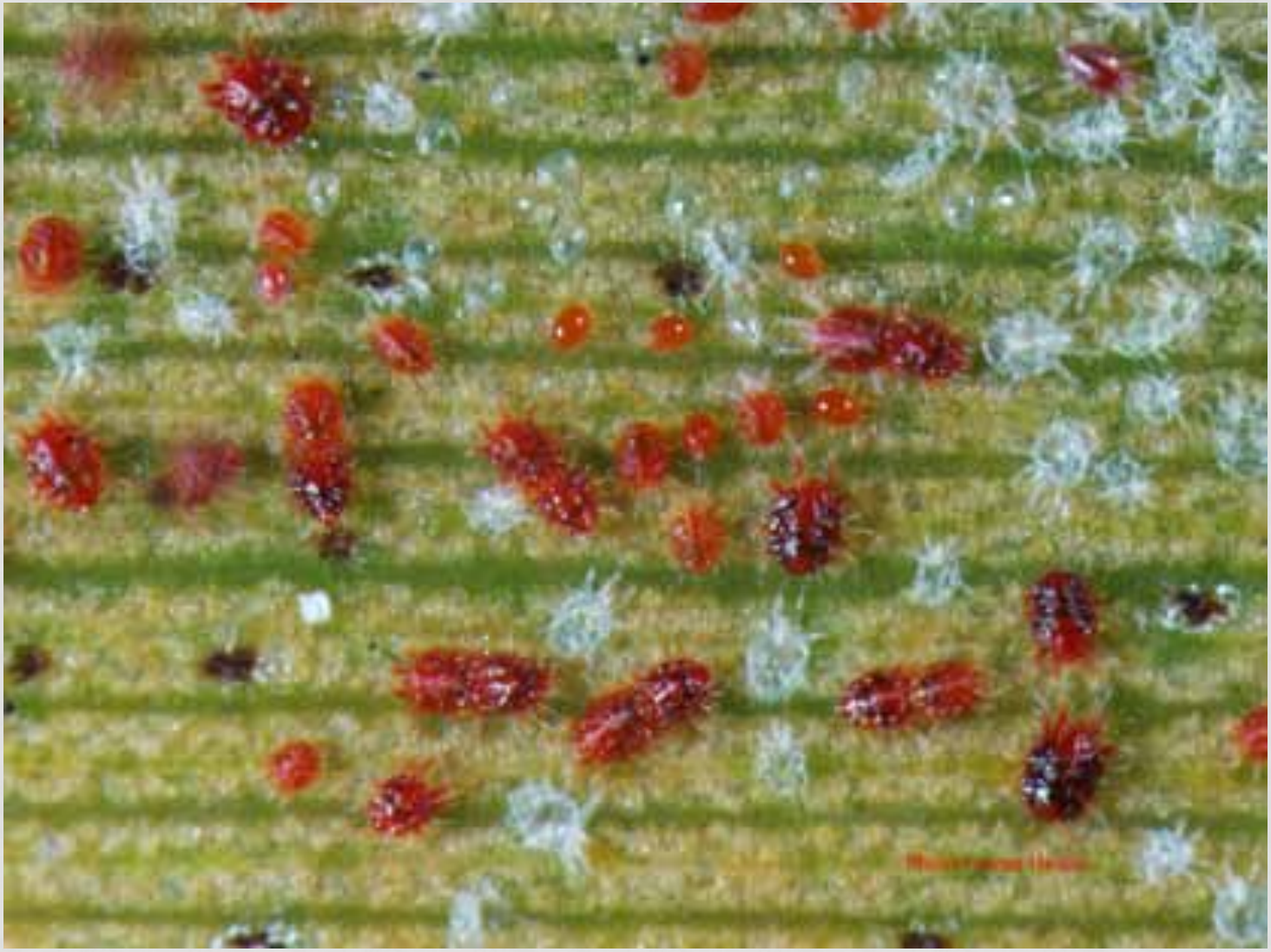
OBJECTIVES

- Bio-prospecting for the presence of natural enemies affecting RPM in Trinidad and Tobago
- Determination of the distribution of natural enemies of RPM in Trinidad and Tobago.
- Identification and determination of the efficiency of potential natural enemies on RPM.


Benefits from Palms
Employment And Recreation
Landscape/ Shelter
Downstream products
Component of Indigenous Biodiversity
Soil Conservation
Food source


CEDROS-ICACOS
06TH APRIL 2006

Red Palm Mite Hirst, 1924 (Acari: Tenuipalpidae)





June 2009

YIELD REDUCTION OF COCONUT FOR PERIOD 2005 - 2011

Coconut Yield Nuts/Year

2005
4,644,000

2006
4,675,000
6.81%

2007
1,953,500
57.94%

2008
946,780
81.3%

2009
842,425
83.207%

2010
841,315
83.229%

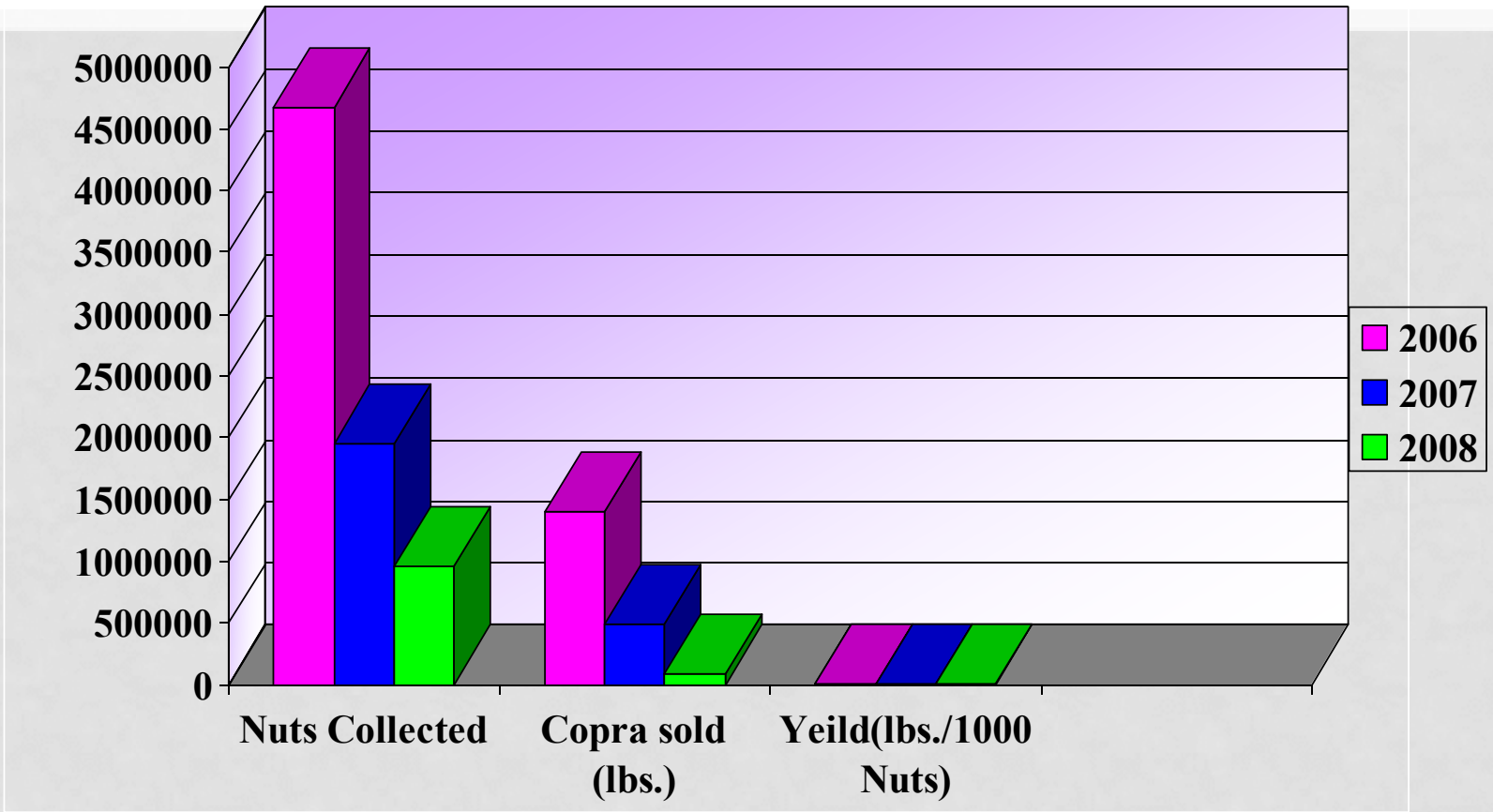
50,049
90.02%
2011

Coconut Yield

Mean 2000-2005

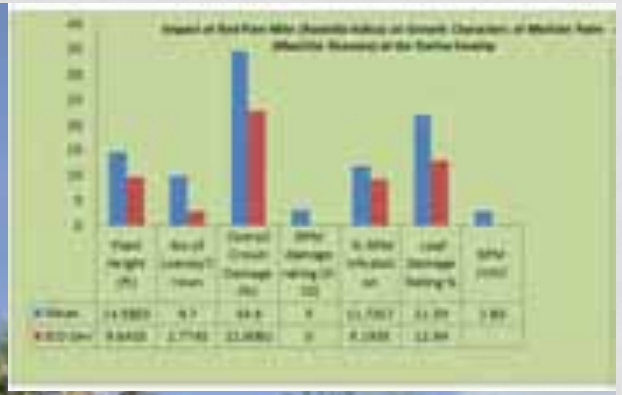
5,016,500

FIGURE 1. COCONUT PRODUCTION AT ST. QUINTIN ESTATE



Decrease in yield: 35 000 nuts/day (2005-2006) to 10 0000 nuts/day(2009)

Decrease in labour: From 75 labourers (2006) to 20 labourers (2009) in the estates



PEST MANAGEMENT

- Agricultural pest management:- pesticide use, ground cover, planting density, fertilizer etc.
- Natural Control
  - Abiotic: climate (rainfall, temp., humidity) and soil
  - Biotic:-host-plant resistance, **natural enemies** and host population

June 2006 September 2006

Effect of rainfall on RPM

September 2006

No infestation of Red Palm Mites

BIOLOGICAL CONTROL AGENTS (NATURAL ENEMIES)

Natural enemies are grouped into:

- Predators
- Parasitoids
- Pathogens (including nematodes).

- In Biological programmes : one or two agents are important, however, many agents contribute collectively in the palm pest complex.

BIOLOGICAL CONTROL

- Involves the introduction of predators and parasites into an environment to control a target pest. It differs from natural control in that it requires human intervention.

- Challenge: Research and development of biological control for any particular pest is a long and expensive undertaking.

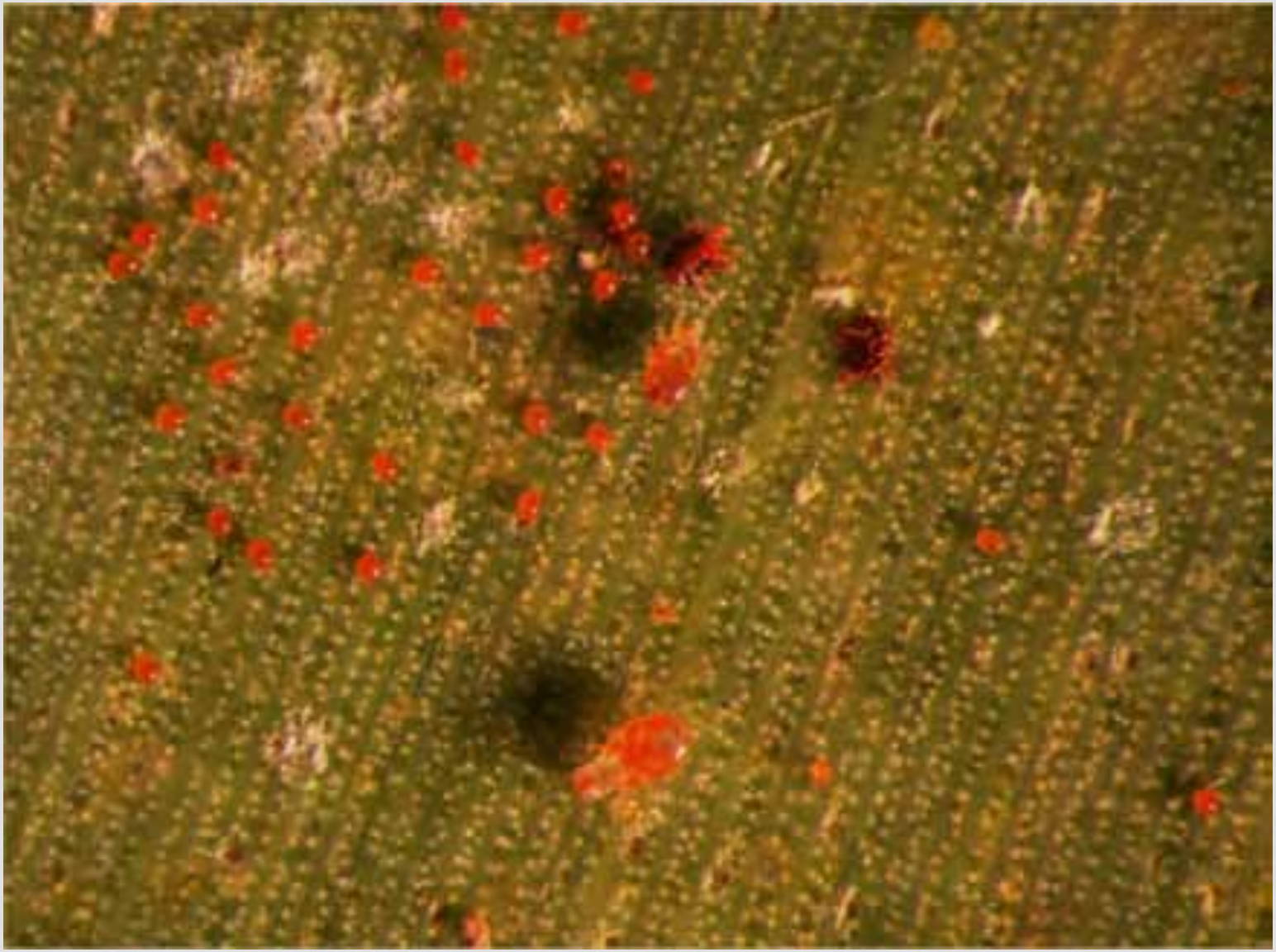
Natural Enemies

- Predatory mites (Phytoseiidae) sucks out the the internal body fluid from the host leaving the body shell behind.
- Sometime shows cannibalistic behaviour, eg. *Amblyseius largoensis*
- The predatory mites were found on most hosts: Ornamental and coconut palms , *Alpinia*, *Heliconia* and *Musa* spp.
- Phytoseiid mites used odors (Kairomones) associated with mite-infested plants to locate their prey.
- Humidity strongly affects the predatory mite efficacy
- Phytoseiid has a high dispersal ability and its distribution is correlated to its prey

BIOLOGICAL AGENTS ASSOCIATED WITH PESTS ON COCONUT IN TRINIDAD

Predators of Coconut scale (Coleoptera: Coccinellidae)
Also found associated with RPM

Phytoseiidae Mite feeding on RPM egg




A
B
C
D
Photo: Farzan Hosein

FUNGAL PATHOGENS

- *Beauvaria bassiana* (> 700 host spp)
- *Metarhizium anisopilae* (>300)

Others:

- *Penicillium*
- *Paecilomyces fumorososeus*
- *Hirsutella sp,*
- *Metarhizium anisopilae*

BIOPESTICIDES

- Many advantages over chemical pesticides
- Safer to use, environment friendly
- Secondary cycling from cadavers can offer a long persistence of the active ingredient

BIO-PROSPECTING AND PERIODIC ASSESSMENT OF RPM AND ITS NATURAL ENEMIES ON PALMS

- Bio-prospecting for natural enemies of RPM and other pests of palms
- Field assessment of RPM and its natural predators on Coconut palm at Manzanilla, Siparia, and Carlsen Field

DIGITIZING RPM COLONIES AND LEAF AREA OF PALM LEAVES

Table showing: Digitised colonies of fungal-infected RPM at North Manzanilla (6th April 2009)

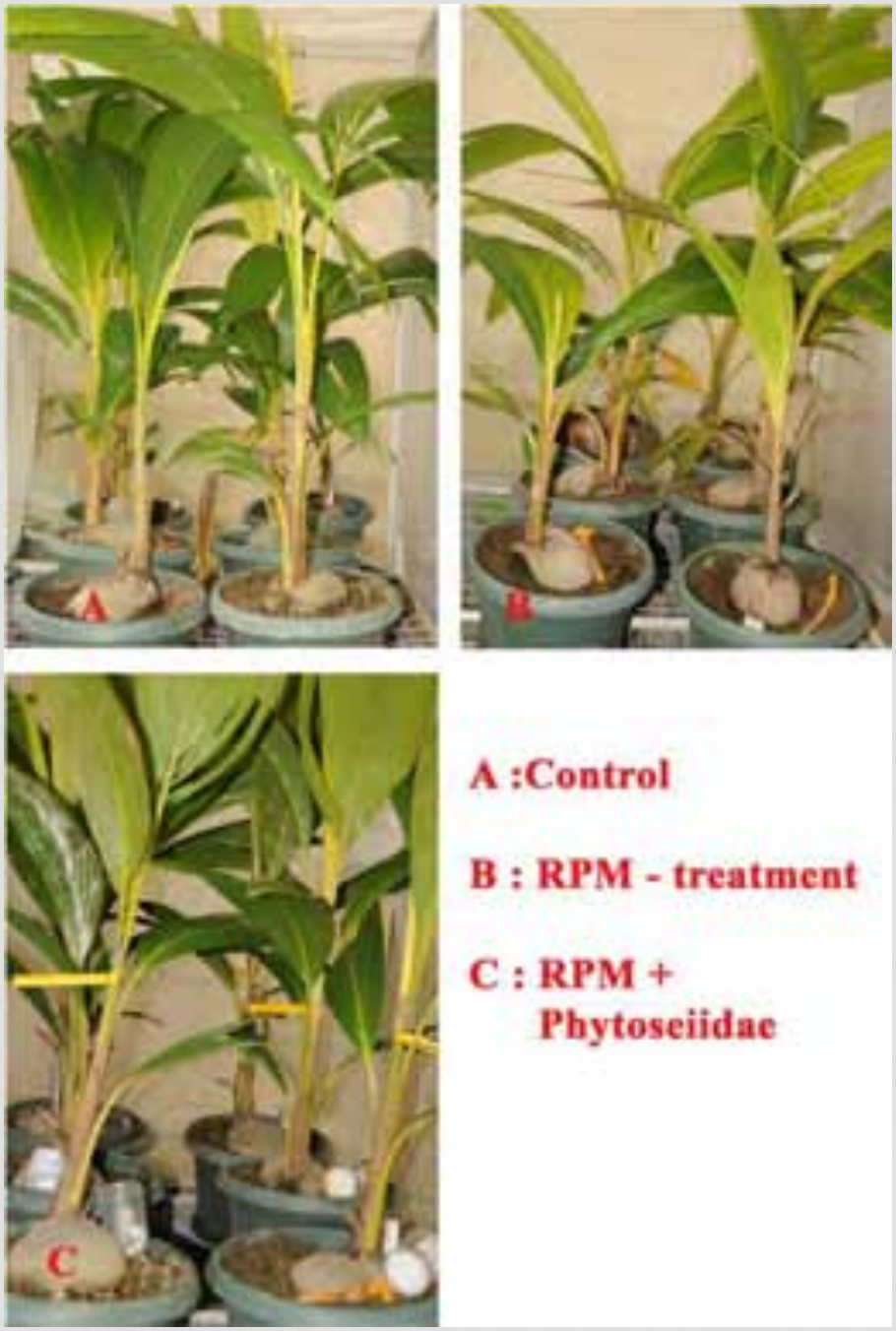
Location	No. Of Colonies	No. Of live rpm	No. Of infected rpm	Infected rpm (%)	No. Of live Rpm/ colony	No. Of infected rpm/colony
U	54	488.00	8.00	1.72	9.04	0.15
M	54	451.50	54.50	11.92	8.36	1.01
L	54	334.00	87.00	30.48	6.19	1.61

U-upper
M-middle
L-lower
*Size 0f 1 colony-0.27cm^2
54=14.58cm^2

Table showing: Digitised colonies of fungal-infected RPM at Toco (15th April 2009).

Location	No. Of Colonies	No. Of live Rpm	No. Of infected rpm	Infected rpm (%)	No. Of live Rpm/ colony	No. Of infected rpm/colony
U	54	490.50	2.25	0.46	9.08	0.04
M	54	977.50	13.50	1.38	18.10	0.25

U-upper
M-middle
*Size 0f 1 colony-0.27cm^2
54=14.58cm^2



Teatment with Red Palm Mite and the Predatory Mite, (*Amblyseius largoensis*) on Coconut Palm at Central Experiment Station, Centeno (MALMR)

Table showing: Predatory mite population in greenhouse experiment of RPM-infested coconut palm.

Treatments	Total rpm			No. Phytoseiidae/leaf		
	U	M	L	U	M	L
1	48.83	67.67	42.33	2.50	5.50	6.00
2	51.50	47.17	75.83	33.67	17.00	57.17
3	57.83	84.33	12.00	2.00	0.67	1.67

U-upper
M-middle
L-lower

1- RPM treated
2-RPM + Phytoseiidae
3- Controlled
*Size 0f 1 colony-0.27cm^2
12=3.24cm^2

Field Studies


Manzanilla


Toco


Carlsen Field

Table showing: Distribution of RPM and natural predators on coconut palms at Manzanilla

Date	No of samples	No. Of leaves	Infestation (%)	Damage rating	Lace wing	Beetles	Rpm	Phytoseiidae/ Leaf			Cunaxidae/ Leaf	Thrips/ Leaf	Mite 2	Rpm/ Cm^2
								Avg	Max	Min				
13/02/8	10	6.65	-	6.45	2.20	4.70	1922.50	9.40	20.00	2.00	0.00	0.00	0.00	10.70
02/06/8	10	8.00	28.50	2.40	4.50	4.60	4349.02	14.10	36.00	1.00	0.10	0.00	0.20	23.61
30/10/8	10	10.20	28.33	3.63	0.93	0.23	3868.13	37.17	64.67	13.00	0.00	0.00	0.17	15.60

Table showing: Distribution of RPM and natural predators on coconut palms at Siparia

Date	No of samples	No. Of leaves	Infestation (%)	Damage rating	Lace wing	Beetles	Rpm	Phytosiidae/ Leaf			Cunaxidae/ Leaf	Thrips/ Leaf	Mite 2	Rpm/cm^2
								AVG	MAX	MIN				
26/02/8	10	11.7	-	1.48	0	0.4	0.23	0.82	0.66	0.16	0	0	0	0.23
9/6/8	10	12.3	0.87	1.7	0.03	1.33	74.67	2.6	17.33	0	1.03	0	0	0.58
14/10/8	10	17.5	0	2.67	0	0	140.93	1.37	5.67	0	0.3	0.07	0.51	0.95

Table showing: Distribution of RPM and natural predators on coconut palms at Carlsen Field

DATE	NO OF SAMPLES	NO. LEAVES	INFESTATION (%)	DAMAGE RATING	LACE WING	BEETLES	RPM	PHYTOSIIDAE/ LEAF			CUNAXIDAE /LEAF	THRIPS/ LEAF	RPM/ CM^2
								AVG	MAX.	MIN.			
16/06/8	10	-	0.53	2.83	0.00	1.6	89.66	0.30	1.33	0.33	6.90	0.27	0.39
06/11/8	10	11.50	0.00	2.30	0.00	0.067	17.80	1.133	3.00	0.33	0.433	0.067	0.078

STACKING METHOD Laboratory Production Of *Amblyseius largoensis*

Predatory mites
100- 200/ container
10-20 mites/leaflet
10 leaflets/ container

Conclusion

- Coconut and plantain are major agricultural crops affected with RPM along the coastline
- A number of natural enemies of RPM exist and these are increasing over time.
- Exploration of the potential of indigenous predators to be given priority.
- Predators may act singly or in combination (Predators/Parasitoids and disease agents e.g. Fungus)
- The use of chemicals is impractical in coconut plantations.
- Digital and video techniques will be used for monitoring and studying the effectiveness of natural enemies
- The progress of this study was affected by staff and the incidence of GAS

THE WAY FORWARD

- Identification and monitoring the efficiency of natural enemies
- Funding for materials and equipment for the multiplication of natural enemies
- Human resources (dedicated trained technicians)
- Training to develop knowledge base
- Facilities for rearing of appropriate hosts and natural enemies to generate populations for release
- Collaboration of stakeholders