



SAMAC
Macadamias South Africa NPC

Strengthening Biosecurity in the Macadamia Industry

Presented by: Kayla Noeth



samac.org.za

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Introduction: Guest Speaker

Ruan van Rooyen is a seasoned technical specialist at Biosyntrix with over five years of experience in pest and disease surveillance. His current focus lies in the deployment and support of automated traps and weather stations across agricultural and forestry systems. Ruan has developed extensive expertise in planning and executing surveillance programs, leveraging both field-based methodologies and digital tools. With strong technical skills, he also provides support for Biosyntrix's suite of cloud-based and mobile applications. Ruan is a qualified Beyond Visual Line of Sight (BVLOS) drone pilot, further strengthening his capability in remote data collection and precision monitoring.



Biosecurity Africa App

Introduction



- ❖ Biosecurity refers to measures taken to prevent the introduction, establishment, and spread of pests and diseases. It includes:
 - Keeping new pests and diseases out of the country and your farm
 - Managing pests and diseases already present
 - Preventing the movement of pests and diseases between blocks or orchards.

Why Biosecurity Matters:

- ❖ Prevents introduction of invasive species
- ❖ Prevents spread of pests and diseases
- ❖ Safeguards yields
- ❖ Reduces economic losses
- ❖ Minimises reliance on pesticides



MAP ILLUSTRATION OF POE

AIR BORDERS

1. OR TAMBO INTERNATIONAL AIRPORT - GP
2. KING SHAKA INTERNATIONAL AIRPORT - KZN
3. CAPE TOWN INTERNATIONAL AIRPORT - WC
4. UPINGTON INTERNATIONAL AIRPORT - NC
5. PILANSBERG INTERNATIONAL AIRPORT - NW
6. POLOKWANE INTERNATIONAL AIRPORT - LIM
7. KRUGER MPUMALANGA INTERNATIONAL AIRPORT - MP
8. PORT ELIZABETH INTERNATIONAL AIRPORT - EC
9. BLOEMFONTEIN INTERNATIONAL AIRPORT - FS
10. LANSERIA INTERNATIONAL AIRPORT - GP

TRANSFRONTIER CONSERVATION PARKS/AREAS

1. AI AIS RICHTERSVELD
2. KGALAGADI
3. GREATER MAPUNGBWE
4. GREATER LIMPOPO
5. LUBOMBO
6. MALUTI DRAKENSBERG

RAIL BORDERS

1. NAKOP (4)
2. RAMATLABAMA (15)
3. BEITBRIDGE (25)
4. LEBOMBO (27)
5. GOLELA (38)
6. MASERU BRIDGE (44)
7. MANANGA (28)

LAND BORDERS

NAMIBIA

1. ALEXANDER BAY - NC
2. VIOOLSDRIFT - NC
3. ONSSEPKANS - NC
4. NAKOP - NC
5. MATA MATA (TAF) - NC
6. RIETFontein - NC
55. SENDELINGS DRIFT - NC

BOTSWANA

7. TWEE RIVIEREN - NC
8. GEMSBOK - NC
9. MIDDELPUTS - NC
10. McCARTHY'S REST - NC
11. MAKOPONG - NW
12. BRAY - NW
14. MAKGOBISTAD - NW
15. RAMATLABAMA - NW
16. SKILPADS GATE - NW
17. SWARTKOPFontein - NW
18. KOPFontein - NW
19. DERDEPOORT - NW
20. STOCKPOORT - LIM
21. GROBLERS BRIDGE - LIM
22. ZANZIBAR - LIM
23. PLATJAN - LIM
24. PONTDRIFT - LIM

ZIMBABWE

MOZAMBIQUE

SWAZILAND

LESOTHO

SEA BORDERS

LAND BORDER DISTANCE: 4471 km

SEA BORDER DISTANCE: 2798 km

AIR BORDER DISTANCE: 7660 km

RAIL BORDERS

TRANSFRONTIER CONSERVATION PARKS/AREAS

AIR BORDERS

LAND BORDERS

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RAIL BORDERS

TRANSFRONTIER CONSERVATION PARKS/AREAS

AIR BORDERS



Biosecurity in Macadamias

- ❖ SAMAC proactively identifies and assesses potential biosecurity threats
- ❖ Some are already present in South Africa, but not yet widespread (e.g. macadamia felted coccid).
 - In these cases, the goal is to contain and slow their spread.
- ❖ Other threats have not yet been detected in South Africa
 - Could be introduced through any port of entry
 - For these, SAMAC pays close attention to country of origin, biology and whether they are known to affect macadamia crops
- ❖ SAMAC also monitors regulated pests and diseases

What is a regulated pest?

A regulated pest is one that is officially controlled by the government due to its potential to cause significant economic, environmental, or social harm.

These pests may be quarantined, restricted, or subject to official control measures to limit their spread. Farmers are legally required to report these pests and follow specific control protocols.



SAMAC Risk Framework

Risk Identification

Identify biosecurity risks to South African macadamia industry

- Risks in SA, not all production areas
- Risks in all production regions, localized
- Risks in SA not on macadamias, with significant risks
- Risks not in SA yet, with significant risk

Risk Assessment

Assess risk to industry based on

- Country of origin + distribution
 - Plant part affected
 - Host range
- Symptoms + Damage potential
- Available control measures

Risk Mitigation

Mitigate biosecurity to macadamia industry following a systematic approach

Training

- Awareness campaigns
- Best practices
- Informational posters
- Biosecurity pamphlets

Surveillance

- Ad hoc surveillance
 - Scout training
 - Field Guide
- Long-term monitoring
- MFC nursery audits

Prevention

- Basic biosecurity measures
- Nursery tree quality

Detection

- Report: SAMAC**
- Sample submission (Disease Clinic)
 - Confirm ID

Containment & Control

- Report: DALRRD**
- Delimiting surveys
 - Quarantine zone
 - Biosecurity measures
 - Implement IPM

Risk Identification

Identify risks to industry based on:

- ❖ Country of origin and distribution
- ❖ Introduction pathway
- ❖ Plant part affected
- ❖ Symptoms
- ❖ Host Range
- ❖ Damage potential (cost to industry)



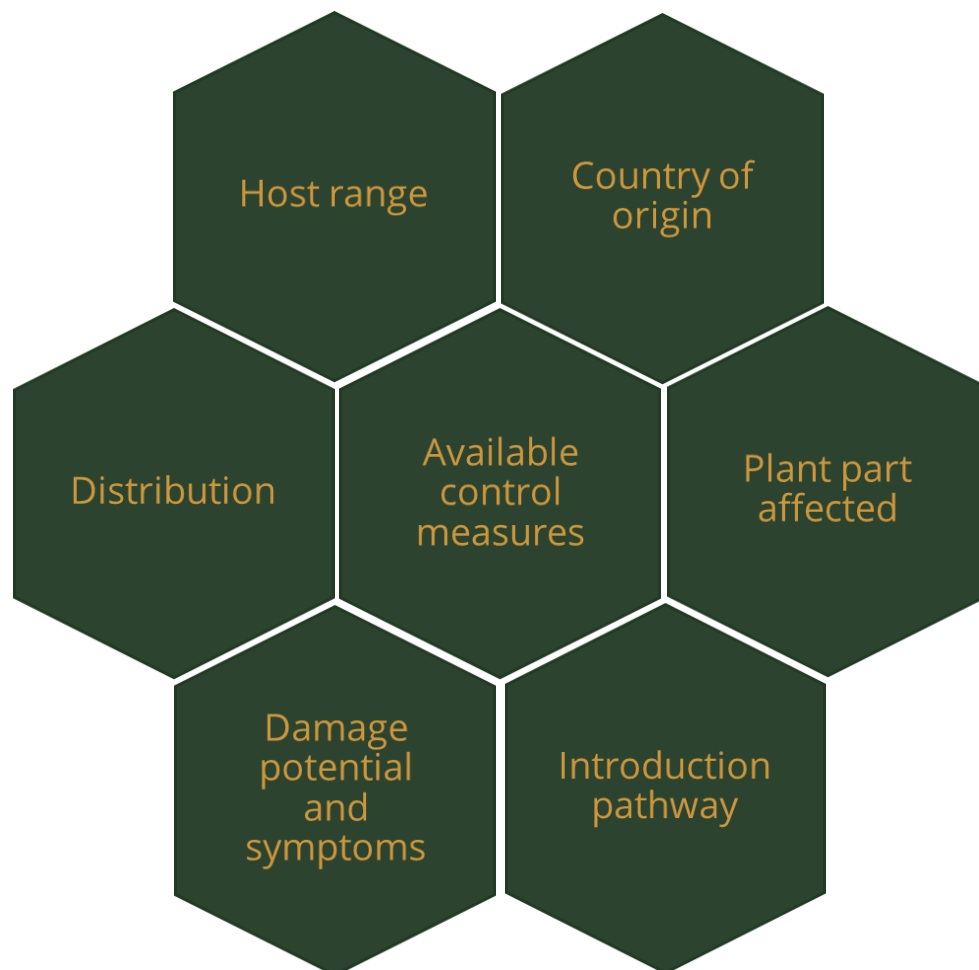
Four broad pest and disease categories

1. Occurring on macadamias and present within ZA, but not all production regions
2. Occurring on macadamias and present within all production regions in ZA, but localized
3. Present in ZA, but not known to occur on macadamias yet
4. Not present in ZA, but poses significant risk to macadamias in ZA



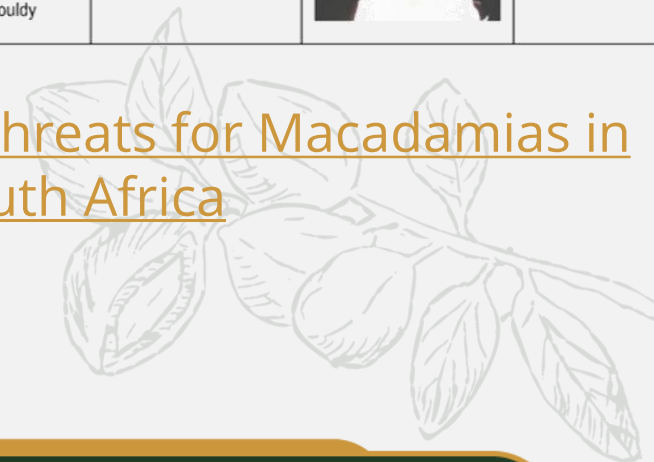
Risk Assessment

Assess risks to industry based on:



Scientific name (Common name)	Country of origin	Pathway	Plant part affected	Symptoms	Risk Reason	Photo	Reference
<i>Halymorpha halys</i> (brown marmorated stink bug)	Asia	International trading ports (hitchhiking, imported goods, plant material)	Likely nuts	Feeding damage on nuts, discolouration, scabbing, necrosis	Highly polyphagous and highly dispersible. Wide distribution globally. Significant pest on other agricultural crops e.g. apples, pecan, pistachios, beans, corn, figs, grapes, peaches, pine, raspberries, soybeans, tomatoes, olives, kiwi and more		CAB International, 2013
<i>Bathycoelia thalassina</i> (cocoa bug)	West and Central Africa	International trading ports and land border posts (hitchhiking, imported goods, plant material)	Nuts	Necrotic lesions in nut kernels, white feeding marks, premature nut drop, deformation of nuts	Significant pest on other agricultural crops such as citrus, cocoa, mango. Phylogenetically related to <i>B. distincta</i>		Lodos, 1967
<i>Hypothenemus obscurus</i> (tropical nut borer)	North America	International trading ports (hitchhiking, imported goods, plant material)	Nuts	Exit holes in husk, extensive tunnelling in husk and nut, kernel becomes mouldy	Confirmed pest of macadamia production in Hawaii and Colombia		Jones et al., 1992

List of Biosecurity Threats for Macadamias in South Africa

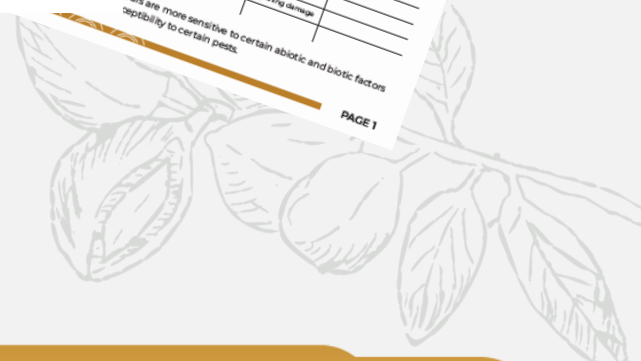


Risk Mitigation

❖ Mitigate biosecurity threats to macadamia industry following a systematic approach:

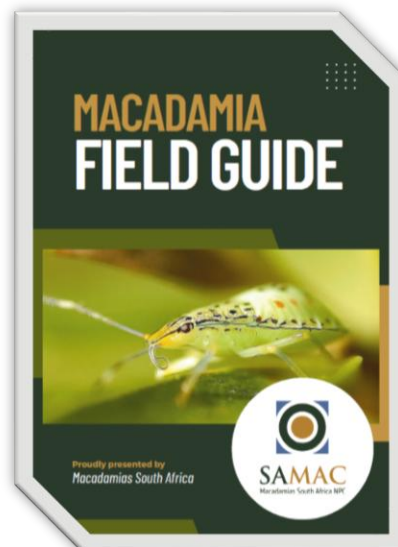


-
- A collection of hazelnuts, some whole and some cracked open to show the nutmeat.



Surveillance

- ❖ Ad-hoc surveillance
- ❖ Scout training
 - Monitoring SOP
 - Monitoring templates
- ❖ SAMAC Field Guide
- ❖ Long-term monitoring
- ❖ MFC nursery audits



Prevention

Basic Biosecurity Measures

1. Plant health

- ❖ Buy good quality trees from SGASA accredited nurseries
- ❖ Inspect them physically for root health and insect and disease presence
- ❖ Quarantine seedlings for 4-6 weeks before introducing to orchards to monitor for MFC throughout its entire life-cycle
- ❖ Support general plant health through good nutrient and water management
- ❖ Establish buffer zones with planted with non-host plants to limit spread of pests and diseases to neighboring farms



BEST PRACTICES in a Nutshell

SAMAC
Macadamias South Africa NPC

Basic biosecurity measures on macadamia farms

1. Plant health

- Start with a strong foundation. Buy good quality trees from Seedlings Growers' Association of South Africa (SGASA) accredited nurseries. Inspect trees before they leave the nursery for root health and insect presence.
- Quarantine seedlings for 4-6 weeks before introducing them into orchards to monitor for MFC throughout its egg-adult developmental stages over four (summer) – six (winter) weeks.
- Support general plant health and the tree's innate immunity through good nutrient and water management.
- If possible, establish buffer zones planted with non-host plants to limit the spread of pests and diseases from other crops or neighbouring farms.

Photo credit: Amorentia Estate and Nursery.

1

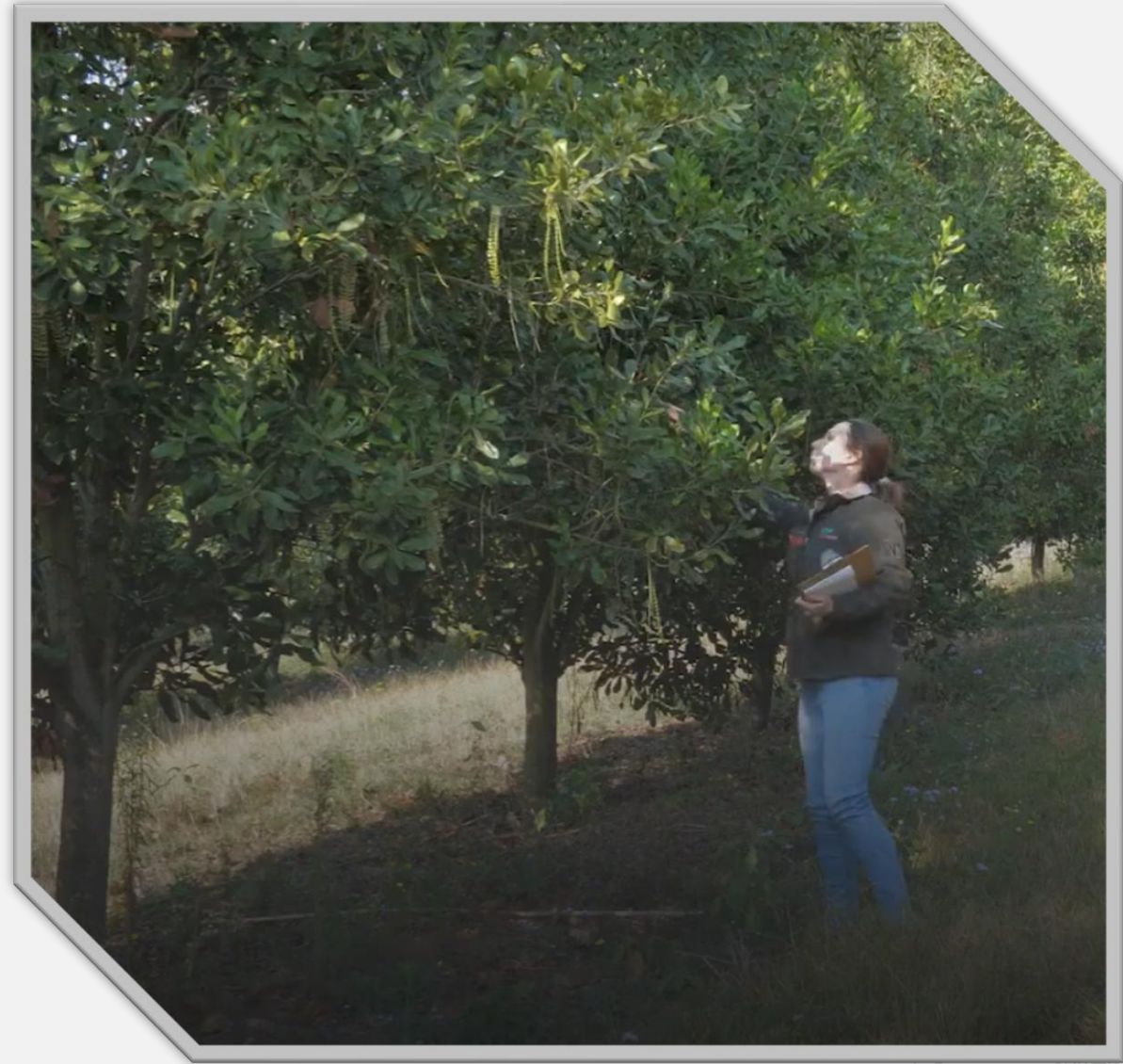
Basic Biosecurity Measures on Macadamia Farms

Prevention

Basic Biosecurity Measures

2. Monitoring

- ❖ Regular monitoring and surveillance is the first line of defence
- ❖ Use the SAMAC Monitoring SOP for guidelines on how to monitor for specific pests
- ❖ Use the FABI Diagnostic Clinic for identification of pests and diseases



Prevention

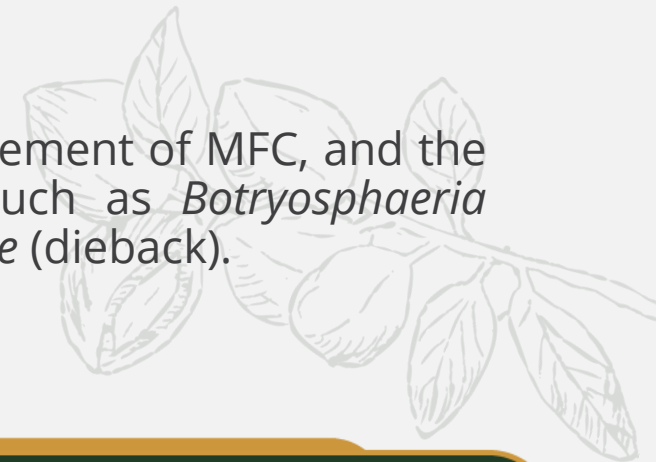
Basic Biosecurity Measures

3. General orchard hygiene

- ❖ Clean equipment, tools, and machinery regularly to prevent the spread of pests and diseases.
- ❖ High pressure air or water can be used to clean vehicles and other machinery.
- ❖ Pruning equipment can be cleaned with a 10% bleach solution, followed by an oil, e.g. macadamia oil, application to prevent rust.
- ❖ Dispose of plant material appropriately, e.g. chipped and solarized or burned to limit the spread of these pests and diseases.



- ❖ Clean equipment and vehicles when moving between infected and other orchards and/or farms.
- ❖ Movement of machinery should always be from uninfested orchards to known infested orchards.
- ❖ Especially NB for management of MFC, and the spread of pathogens such as *Botryosphaeria* and *Fusarium euwallaceae* (dieback).



Prevention

Basic Biosecurity Measures

4. Access Control

- ❖ Place signage at entry points to your farm
- ❖ Maintain a visitor register.
- ❖ Ensure all footwear, clothing, and vehicles are free from any plant material/soil before entering premises.
- ❖ Casual workers and contractors are a specific risk as they move regularly between farms.
- ❖ Provide scrubbing brushes, water, vehicle-, and foot baths with sanitizers at entry points.
- ❖ Limit access of overseas visitors to orchards until they change their shoes and clothing.
- ❖ Provide designated parking bays for visitors and service delivery personnel, and provide farm transport for such persons

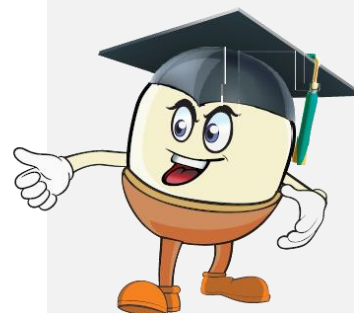
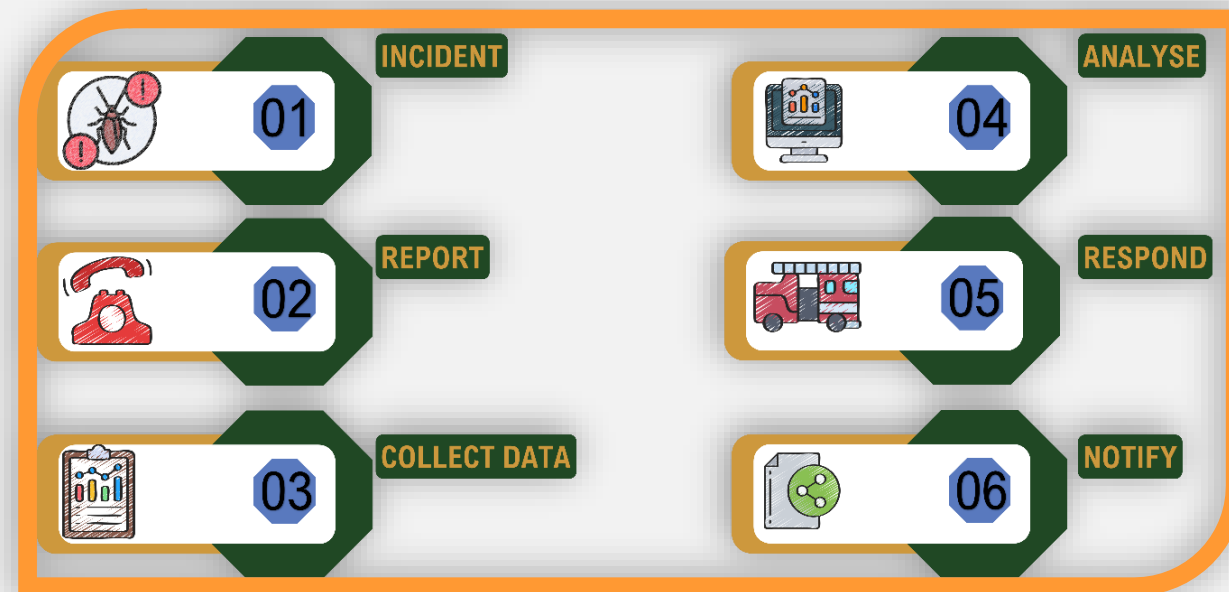


Prevention

Basic Biosecurity Measures

5. Training and Response

- ❖ Ensure scouts are properly trained and have all necessary equipment needed to act
- ❖ Remain updated on new pest and disease threats
- ❖ Develop a response plan for existing and potential threats
- ❖ Inform SAMAC of any suspected biosecurity threats



Prevention Nursery Tree Quality



1. Use SGASA accredited nurseries

- ❖ Confirm nursery is registered with Department of Agriculture- to ensure nursery adheres to national standards for plant production and biosecurity
- ❖ Choose nurseries that are SAMAC members- nursery provides SAMAC with tree volume data according to standardized measures, ensuring transparency and accountability in tree production
- ❖ Choose nurseries that are SGASA accredited- audited annually to ensure compliance with fundamental good nursery practices



Nursery tree quality

When establishing new macadamia orchards, the quality of the young trees planted is crucial for future productivity. High-quality seedlings and clones directly impact the production potential of your orchard for the next 30 years or more. Given the significant costs of establishment and the delayed return on investment, it is essential to start with the best possible foundation by planting top-quality trees. Investing in superior trees will pay off in the long run, ensuring a productive and healthy orchard.

When selecting a nursery for purchasing macadamia trees, it's essential to consider several factors to ensure you receive high-quality trees that will thrive in your orchard.

Nursery selection criteria:

1. Is the nursery registered and accredited?

- Confirm that the nursery is registered with the Department of Agriculture: This registration aims to signify that the nursery adheres to national standards for plant production and biosecurity, indicating the nursery's commitment to adhere to regulations.

- SAI/IAC membership: Choose nurseries that are members of SAI/IAC. These nurseries provide data on tree volumes to SAI/IAC according to standardized measures, ensuring transparency and accountability in tree production.



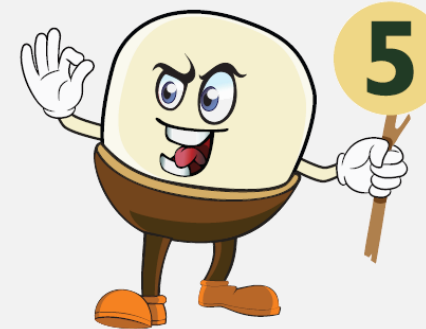
Best Practice: Nursery Tree Quality

Prevention

Nursery Tree Quality

2. General nursery inspections

- ❖ Inspect nursery physically before placing tree order
 - Pay special attention to tree well-being in hardening-off section
 - Look for signs of pests, diseases or physical damage on trees; straight trunks and well-spread branches.
- ❖ Visit nursery again at time of dispatch to confirm quality and size of trees you will receive.
- ❖ Ensure sales agreement is in place.



Prevention

Nursery Tree Quality

3. Tree Quality

TREES

- Trees should be younger than 2 years
- Trees should be of uniform height and at least 60-120 cm above the growing medium to maximize survival in the orchard
- Trees should be of uniform appearance (colour and thickness of the stems)
- Trees should be trained to a central leader
- Stems should be free of any kinks or damage
- Graft unions should not display any callousing, and should not be more than 40 cm above the growing medium to maximize branching and bearing wood
- Graft union tape should be removed to prevent restriction of stems as the trees grow

LEAVES

- Leaves should be a uniform green colour (dark or lighter depending on the cultivar)
- Trees should have at least two hardened-off flushes
- Leaves should be free of any signs of insect damage
- No deficiency symptoms, spotting, fading or other imperfections should be visible

ROOTS

- Roots should be yellow under the bark, brown/black roots are a sign of root rot
- Trees should have well-developed root system with sufficient healthy feeder roots all around the seedling or cutting and throughout the potting mix and a good leaf to root ratio.





Central leader



Kinks or damage



Graft unions



Hardened-off flushes



Insect damage



No deficiency



Brown roots



Pot-bound



Spiral

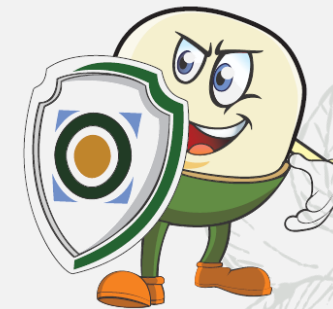


Prevention

Nursery Tree Quality

4. Pest & disease screening and management

- ❖ Pest and disease management crucial for healthy nursery trees & successful establishment in-field
- ❖ SGASA accredited nurseries follow guidelines for *Phytophthora* testing and remediation.
- ❖ Regular testing of irrigation water and planting medium + inspections for MFC in mother blocks.
- ❖ Nurseries should have strict dispatch protocols for pest and disease management.



Detection

If you have detected a suspected biosecurity threat:

1. Contact SAMAC (Kayla, Elrea)
2. Submit samples to the FABI Disease Clinic to confirm ID



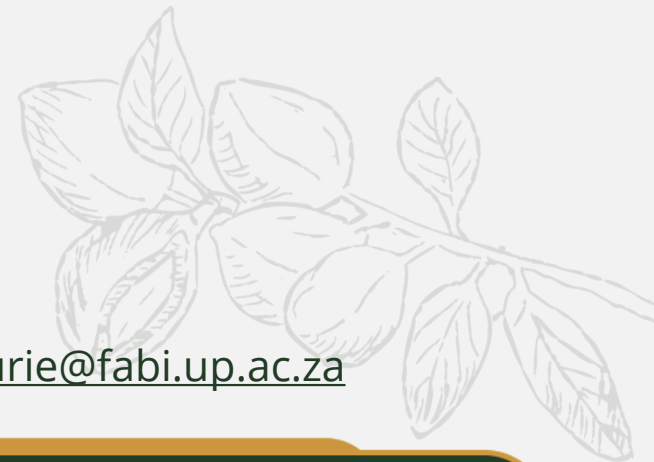
See something?
Say something!

Contact Details:

Kayla: kayla@samac.org.za

Elrea: Elrea@samac.org.za

FABI Disease Clinic: gerda1.fourie@fabi.up.ac.za



Detection

Macadamia Protection Programme: Disease clinic

- ❖ Diagnostic service available for members- free
- ❖ Field Extension
- ❖ Courier service

❖ Diagnostic Sample Submission

❖ How to sample for diseases

❖ How to collect insects



MaPP Core Team



Programme Leader
Prof. Gerda Fourie



Senior Researcher
Dr. Rosali Moffat



Disease Clinic Manager
Nicolette Sianyuka



Field Extension Officer
Steven Shange

Control and containment

- ❖ Notify Department of Agriculture/ National Plant Protection Organisation of South Africa (NPPOZA)
 - Responsibility of SAMAC
- ❖ Delimiting Surveys
- ❖ Establish quarantine zones
- ❖ Implement biosecurity measures and IPM protocols



agriculture

Department:
Agriculture
REPUBLIC OF SOUTH AFRICA



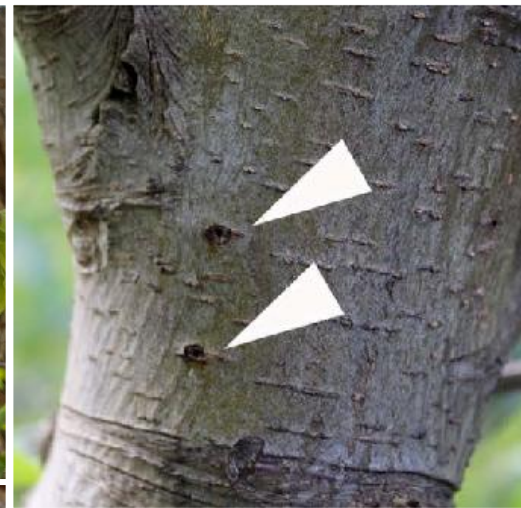


Top Biosecurity Threats for Macadamias in South Africa





PSHB







Mosquito Bug



Mosquito Bug vs Braconid wasp (Beneficial)



Antennae: Mosquito bug adult (segmented antennae) vs Braconid wasp (unsegmented antennae).



Ovipositor: Mosquito bug adult (short ovipositor) vs Braconid wasp (long threadlike ovipositor).

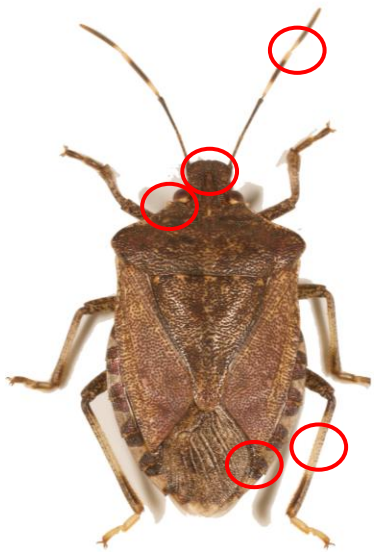


Thoracic 'Horn': Mosquito bug adult (thoracic 'horn') vs Braconid wasp (no 'horn').

Note: Braconidae wasps are often a bright red colour.



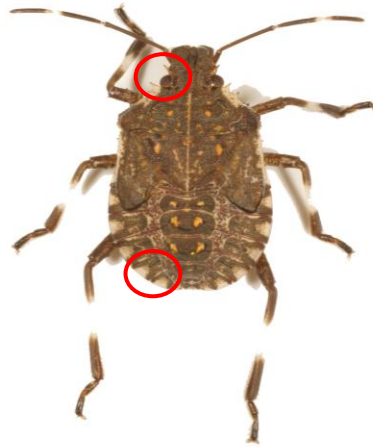
MAYO MACS
macadamias



Female



Male



5th instar



4th instar



3rd instar



2nd instar

Brown Marmorated Stinkbug



Seed weevil



Biosecurity Hub



SAMAC Biosecurity Hub

