Pest diagnostics in phytosanitary systems

Some invasive scale insects (Hemiptera: Coccomorpha) spreading in Africa

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Introduction

Sap-sucking scale insects (Hemiptera: Sternorrhyncha: Coccomorpha)

- Are some of the most overlooked agricultural pests
- They extract plant sap, interfering with photosynthesis, weakening the plant and reducing yield
- Many scale insects expel copious sugary honeydew, resulting in sooty mould growth

Photo: P.A.C.Ooi, ex-CABI

Introduction contd

Sooty mould

- Blocks light and air from leaves, causes wilting, defoliation and dieback.
- Reduces the market value / marketability of produce.

The aim of this presentation is to raise awareness of the damage introduced scale insects (including meaybugs) can cause.

Photos: Darwin Initiative project in Kenya

Introduction contd

- Countries with porous borders are at risk of new introductions on fresh produce and live plants
- Scale insects are very small and mostly avoid sunlight, so infestations often go unnoticed
- Many farmers do not recognise scales as insects or realise that they are a problem
- Invasive scale insects on produce for export present a plant quarantine risk and may cause rejection of shipments

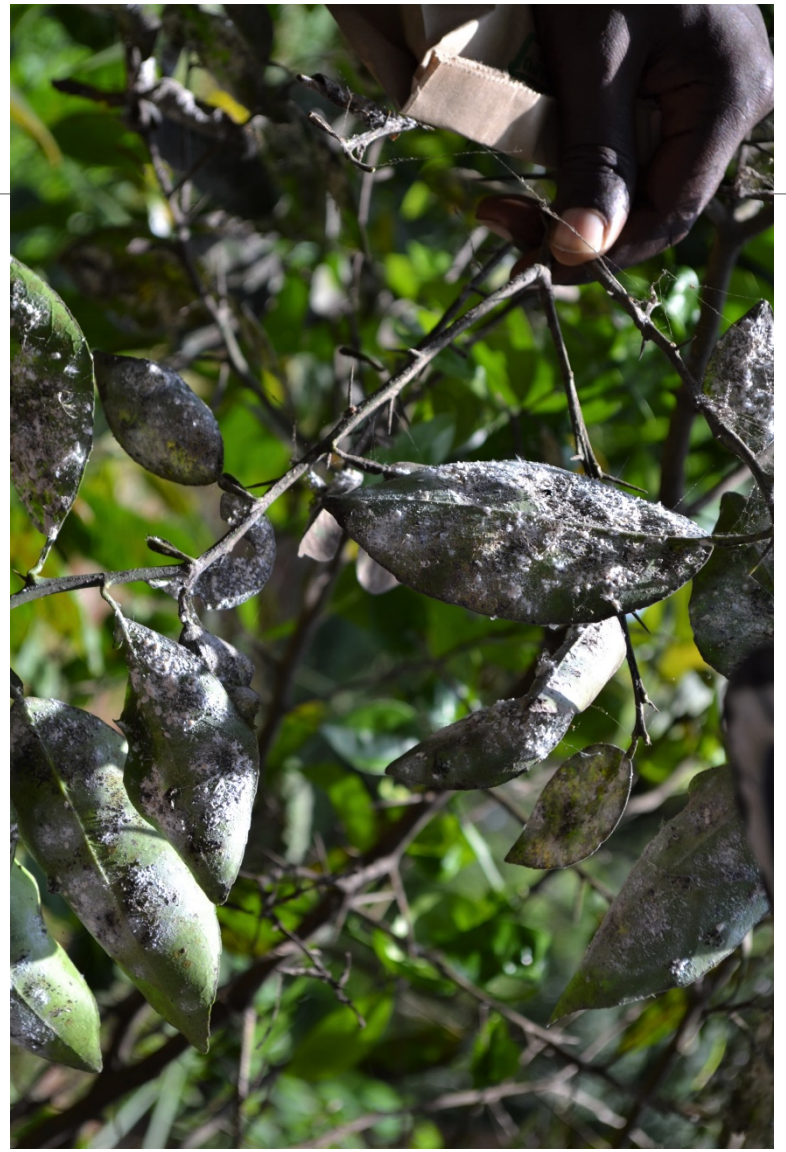

Photo: Darwin Initiative project in Kenya

Introduction contd

Papaya mealybug, *Paracoccus marginatus,* invaded Kenya

- First found in 2 coastal counties in 2016, causing up to 91% loss of the pawpaw crop
- Infesting and killing papaya (*Carica papaya*)
  - also impacting cassava (*Manihot esculenta*), chili pepper (*Capsicum annuum*), guava (*Psidium guajava*), mango (*Mangifera indica*), eggplant (*Solanum melongena*) and other hosts.

Photos: A. Winotai, Thailand

Methodology

U.K. Darwin Initiative-funded project on scale insects in Kenya, 2018 -

- Studied old samples in insect collections at KALRO, Nairobi and the Natural History Museum, London, U.K. (about 6,000 slide mounts)
- Also identified recent samples of scale insects from small farms in 3 coastal counties (113 samples) and 7 inland counties (55 samples)

Photo: The Natural History Museum, U.K.

Results

- Found that about 25% of introduced scale insect species are pests, but only about 6% of native African species damage crops.
- **Mealybugs** (Pseudococcidae) often infest fruit trees in coastal Kenya; they produce honeydew and cause sooty mould.
- Mealybugs cause more serious problems if **ants** are in attendance. They defend the mealybugs from natural enemies and help to spread infestations.
- **Armoured scale insects** (Diaspididae) often infest fruit trees in coastal Kenya; they do not produce honeydew but inject

Photos: California Dept. of Food & Agriculture

Results contd

Recently introduced mealybug pests in Eastern Africa

***Paracoccus marginatus* (papaya mealybug)**
from northern South America

- Makes the flesh of infested pawpaw fruits hard and bitter.
- Impacts pawpaw, cassava and vegetables; survives on weeds between cropping seasons.
- Usually not ant-attended.
- In Kenyan coastal counties, found in 23% of samples, with very low levels of parasitism. Present throughout Kenya, Mozambique and Tanzania and likely to continue spreading.
- Parasitoid wasps (Hymenoptera: Chalcidoidea) used for biological control are known

Photo: F. Makale, CABI

Results contd

Recently introduced mealybug pests in Eastern Africa contd

***Phenacoccus solenopsis* (solenopsis mealybug)**
from southwestern North America

- Can cause serious damage to cotton.
- Tolerates a wide range of conditions including semi-desert.
- In Egypt, Ethiopia and Sudan, and probably spreading.
- Parasitoid wasps used for biological control are known.

Photo:
https://apps.lucidcentral.org/ppp/text/web_mini/entities/cotton_mealybug_373.htm

Results contd

Recently introduced mealybug pests in Eastern Africa contd

***Pseudococcus cryptus* (citriculus mealybug)** from South America

- On citrus, often ant-attended for its honeydew; the ants deter attack by natural enemies.
- Thrives in hot conditions.
- In coastal Kenya and Zanzibar, and probably more places.
- Parasitoid wasps used for biological control are known.

Photo: F. Makale, CABI

Results contd

Recently introduced mealybug pests in Eastern Africa contd

***Rastrococcus invadens* (fruit tree mealybug)**

- Attacks fruit trees, can cause crop failure on mango.
- Widespread in West Africa, now in Rwanda and spreading.
- Parasitoid wasps used for biological control are known.

Photo: T. Kondo, Agrosavia, Colombia

Results contd

Introduced armoured scales in Eastern Africa

All found mainly on citrus. Heavy infestations cause chlorosis and premature leaf drop, dieback of twigs and branches, stunting and distortion of fruit, and premature fruit drop.

***Aonidiella comperei* (false yellow scale)**
possibly from Australasia

- Also found on palms and banana, mostly on leaves.
- No parasitoid wasps (Hymenoptera: Chalcidoidea) for biological control known.

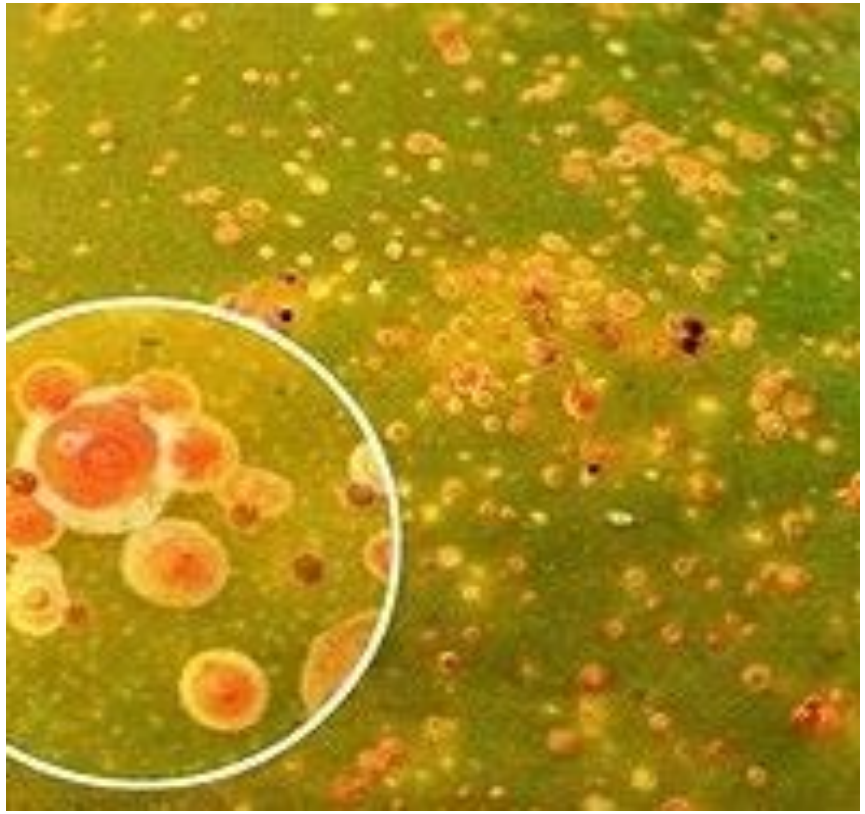

Photo: https://www.agrolink.com.br/problemas/cochonilha_3013.html

Results contd

Introduced armoured scales in Eastern Africa contd

***Fiorinia proboscidaria* (snout scale)** from Southern Asia

- Mostly on leaf undersides, difficult to see.
- No parasitoid wasps used for biological control known.

Photo: https://www.growingproduce.com/crop-protection/watch-out-for-snout-scale-in-florida-citrus/

***Parlatoria ziziphi* (black parlatoria scale)** from Southern Asia

- Mostly on leaves but sometimes on fruits.
- The black scale covers cannot be washed off fruits, so impact their market value / marketability.
- No parasitoid wasps used for biological control known.

Photo: https://www.facebook.com

Discussion

Introduced insects become pests because

- They have escaped their natural enemies.
- African natural enemies do not recognise the alien species as prey or hosts.
- Water-soluble pesticides are not very effective against waxy scale insects but kill their natural enemies.
- The loss of natural enemies also benefits other insect pests, whose populations may increase.

Photo: Darwin Initiative project

Recommendations

- **Train extension officers and farmers** to recognise scale insects and mealybugs

- **Provide them with advice on sustainable control methods**, e.g.:
  - clear weeds away from crop plants
  - use only clean planting material
  - only plant mealybug-resistant varieties (if known)
  - prune to prevent fruit tree canopies from touching
  - prune out and destroying scale infestations and ant nests
  - apply sticky bands to fruit tree trunks to exclude ground-nesting ants from the canopy
  - use water jets to remove dense mealybug infestations from fruits

Photo: Darwin Initiative project

Acknowledgements

Darwin Initiative project collaborating institutions:

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WHERE HERITAGE LIVES ON

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CABI

NATURAL HISTORY MUSEUM

Acknowledgements contd

Theme: *"Enhancing Phytosanitary Systems for Healthy Plants, Safe & Sustainable Trade"*
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