INTEGRATED PEST MANAGEMENT OF TERMITE AND BUNCH MOTH IN OIL PALM PLANTED ON PEAT IN MALAYSIA

ZULKEFLI MASIJAN
NORMAN HJ KAMARUDIN, RAMLE MOSLIM & MOHD BASRI WAHID

zulmas@mpob.gov.my
INTRODUCTION

- Termite & bunch moth – common oil palm pests on peat

- Information on biology, life cycle & behavior - developing IPM for both pests

- Termite:
  - Six castes; workers, nymphs, alates, king & queen
  - damage caused by workers caste
- damaging shoot & trunk

➢ Bunch moth:

- Life cycle; eggs, larvae, pupae & adults

- Damage inflorescences & bunches

- At high infestation – affect fruit set
Location of termite & bunch moth study in Malaysia

* Bunch moth study location
* Termite study location
Termite (Anai-anai)
Termite infestation - as early as 12 months (may lead to death, > 3% of standing palm)

Population study recorded 45 species in oil palm in peat
TERMITE POPULATION STUDY

Methods:
1. Rubber wood stake
2. Transect belt

Removing rubber wood stake

Excavation patterns of several termite species

Collecting termite with transect belt method
TERMITE SPECIES DETECTED IN OIL PALM PLANTATION IN MALAYSIA

<table>
<thead>
<tr>
<th>Method of sampling</th>
<th>*</th>
<th>Families</th>
<th>Subfamilies</th>
<th>Genus</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rubber wood stake (Sarawak peat soil)</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Transect-belt (Sarawak peat soil)</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>15</td>
<td>22</td>
</tr>
<tr>
<td>Transect-belt (Sarawak mineral soil)</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>Rubber wood stake + Transect-belt (Malaysia)</td>
<td>8</td>
<td>3</td>
<td>6</td>
<td>20</td>
<td>45</td>
</tr>
</tbody>
</table>

* : Locations of termite population study
Head and mandible shape of Coptotermitinae soldier detected with rubstake.

- **Coptotermes curvignathus**
  - Size: largest & vigorous

- **Coptotermes sepangensis**

- **Coptotermes kalshoveni**
  - Size: smallest

**Anatomical features:**
- Mandible
- Fontanelle
- Head width
- Pronotum
Soldier of common non-pest termite

Macrotermes gilvus
- biggest in size; litter feeder & fungus grower; mound termite

Schedorhinotermes
- damp wood termite; major & minor soldier; locomotory

Nasutitermes
- long nasus on soldier head; dead wood feeder
Symptom & damage

frond

bunch

Trunk

spear

Advanced infestation

Dead palms
Infestation & damage on trunk
Cross-section of oil palm trunk

Termite infestation starts from shoot and not from base of palm

Absence of termite tunnel or damage on oil palm base while serious infestation on trunk, frond base and shoots
Base on visual observation:
3 stages of termite infestation.

1. Initial stage
   Presence of fresh mud-work, spear and fronds are still green.

2. Intermediate stage
   Discolouration of spear & upper two young fronds turn to yellowish brown.

3. Advanced stage
   Spear & upper fronds start to dry up, turning brown, finally spear become rotten and collapse.
SERWERITY OF PEST TERMITE INFESTATION

Initial stage

Intermediate stage

Advanced stage
IPM OF TERMITE

i/ Early warning system- census
   - visual observation on fresh mud-work
   - baiting with rubber wood stake @ corrugated cardboard in termite detector station

ii/ Mark infested & six adjacent palms
   - to avoid new infestation at nearest palms

iii/ Treat with chemicals
   - scrape the mud-work to improve penetration
   - avoid dry season
TERMITE DETECTION WITH RUBBER WOOD STAKE

- Installing
- Removing
- Collecting & Identification
TERMITE BAITING USING CORRUGATED CARDBOARD IN TERMITE DETECTOR STATION

Pest termite

Non-pest termite
Type of insecticides, rates, frequency and methods of application of termite control

<table>
<thead>
<tr>
<th>Insecticides</th>
<th>Rates</th>
<th>Frequency</th>
<th>Methods of application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fipronil</td>
<td>5ml/ 5 liters water</td>
<td>Every 5-6 months</td>
<td>Spraying &amp; drenching Baiting</td>
</tr>
<tr>
<td>Chlorpyrifos</td>
<td>38 ml/5 litres water</td>
<td>Every 2-3 months</td>
<td>Spraying &amp; drenching</td>
</tr>
</tbody>
</table>

scraping the mud-work

spraying mature palm with fipronil
Termite control management with water-table

Increasing water-table can force termites to surface

BMP peat water-level 50-70cm

Adjustable weirs made from sand bags to increase water-table to 15-30 cm
Other control methods

Destroying termite food sources

*Metharizium anisopliae* killed 100% of pest termite at 8 DAT in laboratory
BUNCH MOTH
(ulat tandan)
*Tirathaba rufivena* (*Tirathaba mundella*)
• Known as “inflorescences moth” @ “fruit moth”

• This pest also attacks Nipah fruticans, Plectocomia spp, Pritchardia pacifica and Roystonea regia

The incidence was reported in peat area in Mukah, Sibu & Miri, Sarawak
Biology of bunch moth: Life cycle 1 month

- **Eggs**: 4-5 days (batches of 4-20)
- **Larva (5-6 instars)**: 14-21 days
- **Adult**: 8 days
- **Pupa**: 10-12 days
Symptom & damage

- Larvae feeds on both male & female inflorescences
- Pitting & scoring fruits
- Faeces are moist & reddish brown when fresh
- Damage fruit falls prematurely or without kernel
Population study of bunch moth
Male inflorescence
Female inflorescence
Chopping of infested bunches & female inflorescences to determine actual number of larvae & pupae.
IPM OF BUNCH MOTH

i/ Early detection & regular census
- visual observation on fresh damage & frass
- chopping the infested inflorescences or bunches to determine the bunch moth stages

ii/ Treat with chemicals
- *Bacillus thuringiensis* – every 2 weeks
- Cypermethrin – avoid spray drift on male inflorescences

iii/ Cultural practice
- removing female inflorescences – disbudding, ablation, castration, deflowering
- sanitation practice; removing rotten bunches
- consistent on doing the practice
## DISTRIBUTION OF LIVE LARVAE FROM INFESTED FEMALE INFLORESCENCES & BUNCHES FROM YOUNG PALM (18 months)

<table>
<thead>
<tr>
<th>Inflorescences stage</th>
<th>n</th>
<th>Mean ± SE</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre anthesis (female)</td>
<td>17</td>
<td>5.20 ± 1.35</td>
<td>0-23</td>
</tr>
<tr>
<td>At anthesis (female)</td>
<td>16</td>
<td>7.56 ± 1.97</td>
<td>0-27</td>
</tr>
<tr>
<td>Post anthesis (female)</td>
<td>14</td>
<td>8.0 ± 1.91</td>
<td>1-21</td>
</tr>
<tr>
<td>Bunch</td>
<td>70</td>
<td>4.79 ± 0.55</td>
<td>0-18</td>
</tr>
</tbody>
</table>
## DISTRIBUTION OF LIVE LARVAE *T. rufivena*
FROM YOUNG PALM (ABLATION PROGRAM)

<table>
<thead>
<tr>
<th>Infestation stage</th>
<th>n</th>
<th>Mean ± SE</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female inflorescence</td>
<td>13</td>
<td>19.4 ± 4.4</td>
<td>0-39</td>
</tr>
<tr>
<td>Male inflorescence</td>
<td>12</td>
<td>35.3 ± 15.7</td>
<td>1-207</td>
</tr>
<tr>
<td>Bunch</td>
<td>10</td>
<td>9.9 ± 3.5</td>
<td>1-30</td>
</tr>
</tbody>
</table>
Spraying infested inflorescences and bunches

- **B. thuringiensis** spray at 500g/ha
- **Treats** every 2 weeks
- **Add wetting agent to improve penetration**

Avoid direct spray of cypermethrin onto anthesising male inflorescence

Dead weevils 15 minute after contact with cypermethrin
**EFFECT OF DIFFERENT INSECTICIDES AND BIOLOGICAL AGENTS IN CONTROLLING BUNCH MOTH POPULATION**

<table>
<thead>
<tr>
<th>No.</th>
<th>Common Name</th>
<th>Trade Name</th>
<th>Application Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Control</td>
<td>-</td>
<td>Without insecticides</td>
</tr>
<tr>
<td>2.</td>
<td>Cypermethrin</td>
<td>Cypermethrin</td>
<td>300ml/16L water</td>
</tr>
<tr>
<td>3.</td>
<td>Chlorantraniliprole</td>
<td>Prevaton</td>
<td>8ml/16L water</td>
</tr>
<tr>
<td>4.</td>
<td><em>Bacillus thuringiensis</em></td>
<td>MPOB Bt</td>
<td>640ml/ 16L water</td>
</tr>
<tr>
<td>5.</td>
<td><em>Metarhizium anisopliae</em></td>
<td>-</td>
<td>1 x 10^7 conidia/ml</td>
</tr>
</tbody>
</table>
CONCLUSIONS

✓ Good agriculture practice & sanitation can reduce pest infestation

✓ Fipronil are effective in controlling termite

✓ Biological control agent should be consider as the other alternative in controlling both pests

✓ The awareness of cypermethrin on beneficial insects should be considered to avoid residual and adverse effect.
THANK YOU

See you in
Persidangan Pekebun Kecil Kebangsaan
Sibu 11-12 August 2014