Evaluation of Distribution and Impacts of Parasites, pathogens and Pesticides on Honeybee (Apis mellifera) populations in East Africa

Muli. E
Background

- considerable genetic diversity in *A. mellifera* populations in the region
- populations are largely unmanaged
- Reports of significant decline in colonization of hives; reduction in sizes of migratory swarms; decrease in honey production (NBS, 2007; Beekeeper interviews, 2010)
- Drought given as the main reason
• Varroa mites in E. Africa in honeybee colonies for the first time in 2009 (Frazier et al., 2010)
• a recent introduction; earlier surveys did not detect varroa (Shi Wei, personal comm. 2011)
• In S. Africa, varroa mites introduction was associated with large losses of managed colonies (Allsopp, 2004)
• Varroa mites also vector several honey bee viruses (Chep and Siede, 2007)
• Viruses have negative impact on honeybee health (Ellis and Macedo, 2001; Gisder et al., 2009)
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Methodology

a). Nationwide surveys
   - distribution of parasites, pathogens and pesticides
   - any correlation with honeybee health (measured in terms of colony size)

b). Assayed levels of hygienic behavior – as a measure of resistance to brood diseases

c). Determined assoc. between Varroa loads, viral diversity, HB, location and colony size
Sugar roll
RESULTS

a). Varroa Mites

- 17/19 (89.5) apiaries assayed had Varroa mites
- 2 apiaries w/o Varroa mites
- 55/66 (83%) colonies assayed had Varroa
- Varroa levels highly variable across colonies and apiaries: 0 – 30 mites
- Varroa levels +vely correlated with elevation and with colony size
b). Nosema and Viruses

- 2/16 sites found to have *Nosema apis*

- All colonies in all 24 apiaries assayed for:
  - IAPV,
  - ABPV,
  - BQCV,
  - CBPV,
  - DWV,
  - KBV and
  - SBV

- Only DWV, BQCV and ABPV detected in Kenyan honeybee populations
• Average colony size was not associated with viral diversity

• Significant correlation between viral diversity and Varroa loads

• 8/66 colonies with Varroa infestations had no viruses

• 2/66 colonies had one virus and no detectable Varroa
Viruses
c). Hygienic behaviour

- Assayed 36 colonies in 10 sites
- No significant correlation between HB and elevation or colony size
- Significant negative correlation between HB and number of Varroa in these colonies
- HB significantly associated with viral diversity - lower in colonies with 1 type of virus versus colonies with 0 or 2 viruses
d). Pesticides

- pooled wax samples from 15 sites (1 sample/site)
- pooled bee bread samples from 13 sites
- screened for 171 pesticides and toxic metabolites

- Found:
  - 1-naphthol,
  - chlorothalonil (fungicide) – 12/15 sites
  - chlorpyrifos (organophosphate) – 5/15 sites
  - fluvalinate (broadspectrum pyrethroid) – 1/15 sites
- Low levels (less than 50ppb)
CONCLUSIONS

• Kenyan honeybee populations not yet directly impacted negatively by Varroa

• Time lag before the –ve effects are seen; need for continuous monitoring to evaluate long term dynamics of host-pathogen interactions

• Chemical control methods for Varroa/Nosema maybe unnecessary at this time

• Indeed, the bee populations may posses novel resistance mechanisms
• Environmental factors (climate, landscape ecology) may play a key role in mediating host-parasite interactions

• Varroa mites vectoring viruses
  - Longevity of infected and uninfected colonies
  - Ability of colonies to reproduce

• Low level of pesticides – residues playing only a limited role in honeybee health in Kenya at this particular time
Honeybee Diseases

American Foul Brood Disease

- bacteria, *Paenibacillus larvae*; attacks sealed larvae or young pupae

- Discoloured, sunken, or punctured cappings

- Consistency of brood: soft, becoming sticky to ropy

- Slight to pronounced odour or smell (hence name ‘foulbrood’).
Nosema apis & Nosema ceranea

- Crawling bees
- K-wing bees
- Failure to thrive
- Feacal staining
European Foul Brood (EFB)

• bacterium, *Streptococcus pluton*

• Attacks young unsealed larvae

• Dead brood changes colour to dull white, light brown, dark brown to almost black

• Consistency of brood; watery, non-sticky or ropy
Chalk Brood

- fungus *Ascosphaera apis*

- affected larva becomes overgrown by fluffy, cotton-like mycelia and swells to the size of the brood cell

- larva dries into a hard, shrunken, white chalklike mummy – thus the name chalk brood

- mummies can be found in hive entrances or on bottom boards.
Means of Transmission

- Bee products: especially pollen and beeswax
- Used apicultural equipment: bee boxes and protective clothing
- Live bees and genetic material: queens, package bees, semen, bee eggs
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Shukran!!!