The Biometrical Challenge with Mirids

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The adult mirid

Photos: N. Jessop

Overview of mirid biology and ecology

- Incubation period of eggs is about two weeks
- Five nymphal stages from egg hatching (emergence) to the maturity
- Each stage takes about 5-6 days
- Adults live for about one month
- Patchy distribution noted (usually at early stage of pest)

Economic importance

- Mirid (nymphs and adults) cause damage by feeding on
  - Pods
  - Young unhardened shoots (leads to die-back condition)
  - Estimated yield loss of 20 to 30 percent

Mirids Control methods

- Chemical control
- Screening for resistant clones
- Plant or botanical extracts, eg. Aqueous Neem
- Pheromone trapping
- Myco-Pathogens
- Biological Control with predators and parasitoids (Search may be continuing but no effective natural enemies found)

Biometrical interests

- Selecting the appropriate experimental design.
- A reasonable sample size to increase precision with lower error margins.
- Correct definition of the explanatory and response variables at the outset of experiments
- Reliable data collection
- Appropriate data analysis

Some review (Entwistle,1972)

- Timing and frequency of application
- Calibration for field trials
- Field trial layout

Timing and frequency of application

- Eg. Two times in a year
- Two times in each time with 28 days interval

Calibrations for field trials

- Eye level count (on all trees or large samples)
- Overall count on a group of most heavily infested trees
- Quick spray knockdown on a sample tree
- Amount of new damage present
- Degree

Field trials layout

- Replicate by at least ten times
- Use plots of half to three-quarters of an acre
- Match plots roughly for stature of trees and degree of attack
- Select plots of high mirid numbers
- Pre-treatment record (depending on objective)
- Method of calibration

Development of mirid control methods in Ghana

- Four stages have been involved;
  - Lab screening
  - Cage or simulated field testing
  - Small scale testing
  - Large scale farmer/ researcher managed trials

Biometrical considerations (stage 1 and 2)

- Number of insects known
- CRD or RCBD
- dead insects counted

Small scale testing

- Done on the farmers field by the researcher
- RCBD and Latin square have been used
- Usual mode of assessment of treatment effect is by hand height count

Large scale on farm trials (4)

- Objective is to allow for a general socio economic assessment of method
- Uses farmers land
- Involve larger plot sizes
- Socio-economic assessments made through questionnaire administration

Some measurements (usually before and after treatment applications)

- Count of dead mirids
- Count of dead beneficial insects
- Yield
- Canopy assessment
- Quality assessment

Data analysis

- Investigating distribution properties eg. through Taylor's Power Law
- Modelling approach; analysis of variance (covariance) or generalised linear modelling
- Allow for repeated measures analysis where necessary
- Non-parametric methods

General biometrical challenges

- Needs more replications (which has a bearing on cost and assessment, and spatial variation).
- Assessment of treatment effects may be subjective in field trials (there are many calibrations but each with its own limitations).
- Possibility of non-objective farmers agreeing that a method is effective when it is actually not
- How do we Incorporate climatic information
- A form of bias is introduced as cooperating and reliable farmers have to be chosen from the outset.

Concluding remarks

- The challenges mentioned are drawn mainly with chemical methods of control but generally constraints will depend on the approach in question.

- Statistical strategies must be developed to improve upon objectivity in treatment assessment

What is your experience?

- Thank you very much for your attention