Field Techniques in IPM, PMA 4570/6228

Class Handouts

http://entnemdept.ufl.edu/liburd/fruitnvegipm/teaching.htm
Monitoring involves taking regular notes on pests, natural enemies, crop growth and environment over a specified time within a given area.

**Reasons for monitoring**

- To determine if a pest species is present
- To determine population density
- To determine the distribution of pests’ species
- To apply the most appropriate management program during critical periods
Sampling

- Sampling involves collecting repeated systematic data of an organism in its environment over a specified time.
- Sampling universe is the habitat from which samples are taken.
- Sampling unit is the area within the sampling universe from which measurements are taken e.g. traps, known numbers of plants or parts of plants (leaf, bud), known numbers of sweeps with a sweep net.
- A group of sampling units is referred to as the sample, which is used to estimate the population.
Sampling Units

- YST trap - Adult whiteflies
- Sampling whole plants for FB
- Sampling for TFW eggs

buds
Choosing a Sampling Unit

• Pest species & size of the population
• Mobility and distribution of pest
• The cost of the sampling unit
• Accuracy of the sampling unit

Factors affecting sampling accuracy

- Field size and shape
- Variation between individuals and differences in perception
- Consistency of sampling methods
- The numbers of samples taken
Sample size and Number of Samples

- Pest species and potential for damage
- The crop stage of growth
- Time taken for sampling to be completed
- The level of precision required

General formula to determine a fixed sample size

\[ n = \left( \frac{ts}{D \bar{X}} \right) \]

- \( n \) = the number of samples
- \( t \) = values from ‘student t’ distribution tables
- \( s \) = the standard deviation of a sample
- \( D \) = the predetermined standard error of the mean
- \( \bar{X} \) = the mean of a sample
Pest Distribution Patterns

- **A uniform** distribution occurs when a pest is distributed evenly throughout the sampling universe, every leaf on a plant has 3 adult whiteflies.

- **A random** distribution occurs when a pest is distributed haphazardly in the field.

- **A clumped** distribution occurs when a pest is aggregated within certain areas of the field such as field borders, or centrally within the orchard or planting.
Pest Distribution Patterns

- Random
- Clumped
- Uniform
Absolute versus Relative Sampling

• **Absolute Sample** – counting the total pest population within an area.

**Advantage**
- is fairly accurate and is a good system to use when gathering information about a new pest that has invaded an area.

**Disadvantage**
- very time consuming

**Relative Sample** - count a subset of the entire population

**Advantage**
- not very time consuming
- **Disadvantage**
- reliability varies
Presence – Absence Sampling

- It is used to assess whether the pest is present or not
- Baseline research data must exist to give information about the proportion of infested leaves.

Advantage
- It's fast and simple (improving sampling efficiency)
- Commonly used for sampling small insects that are abundant such as thrips, aphids, whiteflies and spider mites
Sampling Pattern

- **Random Sample** - Most common sampling pattern (avoids unbiased estimates)
  - Samples are taken at randomly selected intervals. For e.g. walking 5 steps to take the first sample and 10 steps to take the second sample etc.

- **Stratified Sample** - Used when there is great inconsistency in the sampled area
  - Dividing the area to be sampled into equal sized units depending on characteristics and sampling each unit independently.

- **Systematic Sample** - Every sampling unit is chosen methodically from a randomly chosen starting point. For eg. collecting one leaflet every 10 plants
In Situ Counts - Direct observation and counts of an insect within its habitat (no special equipment is needed). If insect numbers are low and plants are small all insects on the plant may be counted. If organisms are too scattered to be counted, a selected number of organisms within an area may be sampled. An equipment such as a piece of square metal can be used to assist with the counting. For large plants, known numbers of leaves, stems, flowers, buds or pods are counted.

* The most widely used method of sampling plants
1) *In Situ* Counts
2) Knockdown Sampling

- Insects are removed from the habitat by chemicals, heat or jarring
Netting- A sweep-net is swung into the plant canopy and after a prescribed number of swings, the plant debris are moved and the number of insects caught are counted.

It is inexpensive and adequate sample size can be obtained by increasing the number of swings.
**4) Trapping**

- **Trapping** - One of the most important techniques used for monitoring insect abundance and behavior. Traps are left in the field for a period of time and then insect numbers are counted.

**Types of traps**

- Traps are either attractive or passive.

- Attractive traps rely on visual or chemical stimulus to lure insects to them.

- Passive traps catch insects accidentally.
Attractive (visual traps - color)

Rhagoletis mendax
Attractive (visual traps - shape)

Rebell™-Unbaited

Yellow sticky board

*Rhagoletis cingulata*
Attractive traps rely on insect olfaction. A common attractant is food or sex pheromones.
Passive Trap

Malaise trap

Malaise trap is basically a tent, which is open at the front. The roof converge into a collecting jar. These traps are useful in collecting aphids and leafhoppers.

Plexiglas sticky trap

This is used to trap small flying dipteran insects.
Passive Trap

Pitfall trap - A trap designed for catching ground crawling insects. Usually a container is buried in the ground into which insects fall.