Alternatives to Pesticides

Attract-and-Kill, Mating Disruption, and Mulches

PMA 4570/6228

Attract-and-Kill

- Attractant
  - Color
  - Food bait
  - Pheromones
- Toxicant
  - Insecticide

- Examples
  - Last Call
  - Insecticide Treated Spheres
  - Many traps utilize this method

Insecticide Treated Spheres

- Attractant
  - Color
  - Sucrose
- Toxicant
  - Imidacloprid
  - Spinosad

- Effective against various Tephrididae
  - Apple maggot fly, *Rhagoletis pomonella* (Walsh)
  - Blueberry maggot fly, *R. mendax* Curran
  - Caribbean fruit fly, *Anastrepha suspensa* (Loew)
  - Mediteranian fruit fly, *Ceratitis capitata* (Wiedemann)

Mating Disruption

- Produce large amount of sex pheromones so that males cannot find females to mate with

- Pheromone dispensers
- Twist ties
  - Grape Root Borer (*Vitacea polistiformis* Harris)

Mulches

- Synthetic mulches
  - White mulch
    - Improves plant health
  - Reflective mulch
    - Improves plant health
    - Sunlight reflecting off of the mulch confuses potential pests insects such as aphids and whiteflies
  - Disadvantage
    - Disposal

Mulches

- Natural Mulches
  - Wood chips
    - Improves plant health
    - Some weed suppression
    - Disadvantage: labor intensive
  - Living mulches
    - Live plants intercropped with a cash crop
      - ex. buckwheat, clover
    - Attract and maintain natural enemy populations
    - Disadvantage: competition for resources

Experimental Designs and Hypothesis Testing

Experimental Designs

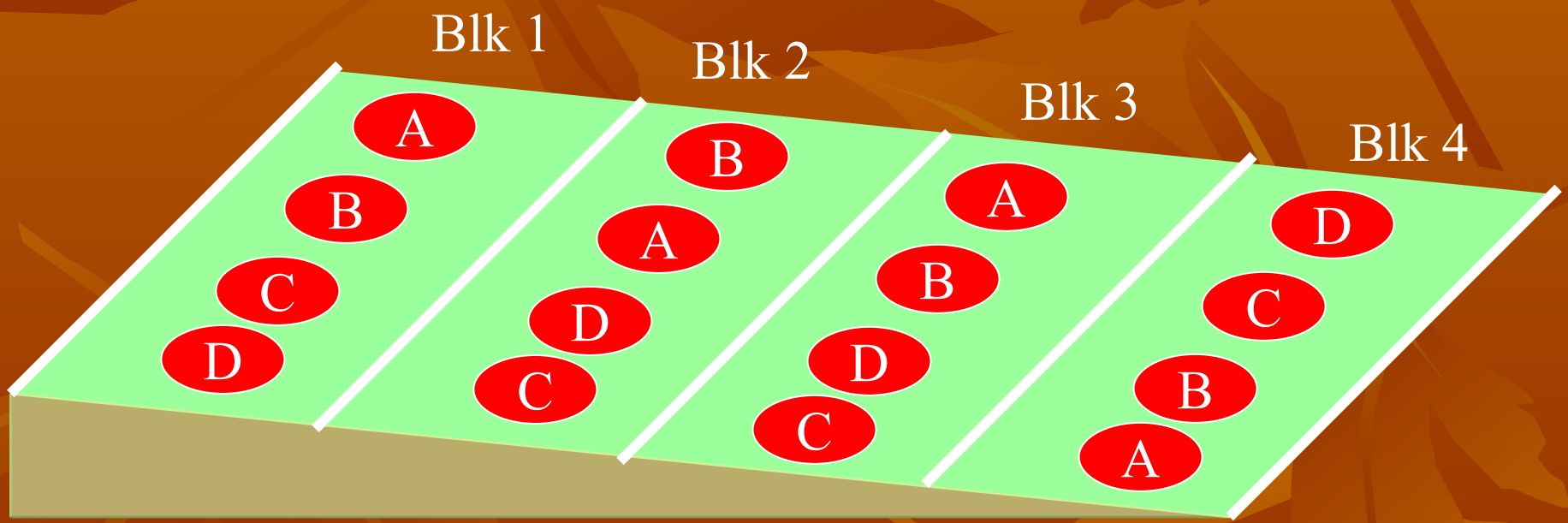
- Completely Randomized Design
- Randomized Block Design
  - Complete
  - Incomplete
- Latin Square
- Factorial
- Split plot

CRD (Completely Randomized Design)

Five artificial diets are going to be compared for egg production of eggs of *H. axyridis* (COL: Coccinellidae). The females are randomly selected from the same colony. Assuming that all the females are homogenous we are going to use a a CRD.

Diet 1	Diet 4	Diet 2	Diet 4	Diet 3
Diet 2	Diet 3	Diet 1	Diet 3	Diet 5
Diet 3	Diet 1	Diet 2	Diet 5	Diet 4
Diet 1	Diet 5	Diet 4	Diet 5	Diet 2

RCBD (Randomized Complete Block Design)



Hypothesis Testing

- Statistics allow us to determine the probability that a hypothesis will be true for any given sample (Flint and Gouveia 2001, p. 216)
  - **H_0**: no difference
  - **H_a**: difference

- Type I Error: reject H_0 when it is true
  - P(Type I) = α
- Type II Error: fail to reject H_0 when it is false
  - P(Type II) = β

Hypothesis Testing

- p-value: probability that observed variation among means could occur by chance

significance probability

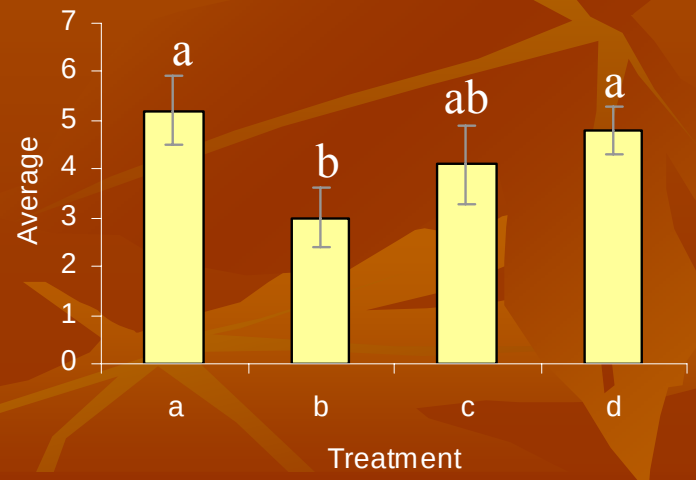
- $P > 0.05$: not significant, therefore do not reject H_0
- $P \leq 0.05$: significant, therefore reject H_0

Common Hypotheses

- Comparing 2 treatment means (t test)
  - H_0: The two treatment means are equal
  - H_1: The two treatment means differ
- Comparing 3 or more treatment means (ANOVA)
  - H_0: All of the treatment means are equal
  - H_1: At least one treatment mean differs
  - A means separation test is used to determine which treatments differ from each other

Means separation tests

- Tukey's test and LSD (Least Significant Difference) are common
- Only perform if ANOVA is significant
- Results look like this:
  - Treatment a 5.2 A
  - Treatment d 4.8 A
  - Treatment c 4.1 AB
  - Treatment b 3.0 B



Simple Linear Regression

- Correlation coefficient: R
  - Between -1 and 1
  - Measures strength of linear relationship between *x* and *y*
- Coefficient of Determination: R^2
  - Proportion of total variation in *y* attributable to variation in *x*

Simple Linear Regression