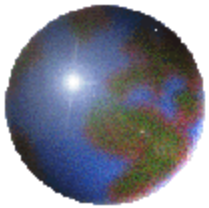


PREDICTING BIOLOGICAL EVENTS

DEGREE DAYS (DD's) AND PLANT PHENOLOGY

THE DEGREE DAY CONCEPT

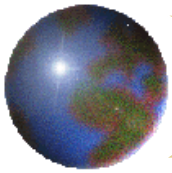
- Factors affecting growth of organisms
  - **Time**
  - **Temperature**
  - Both factors are dramatic for cold-blooded animals (ie. plants, insects, mites)
    - Cool temperatures delays growth
    - Warm temperature accelerate growth
- **Physiological growth**
  - Combination of growth and time

CALCULATING DEGREE DAYS

- Degree days used to predict physiological time

- **Degree days (DD's)** – accumulation of heat units above some minimum temperature for a 24 hour period

- $$DD_{50} = \frac{Temp_{max} + Temp_{min}}{2} - 50^{o}F$$

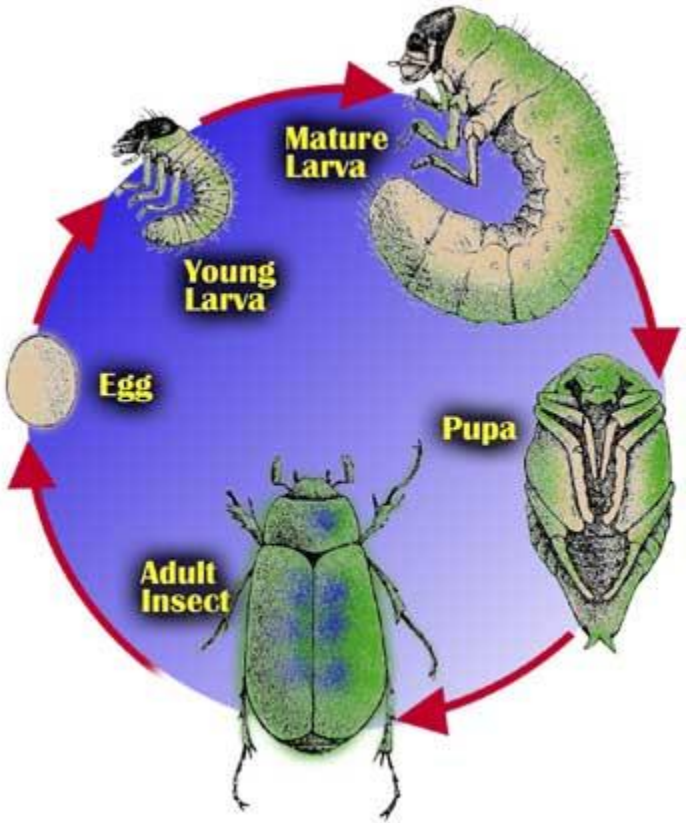


DEGREE DAY THRESHOLDS

- Growth only occurs within a range of temperatures
- **Minimal developmental threshold**
  - Minimum temperature below which no growth occurs
  - 50^{o}F for insects
  - 30-32^{o}F for plants
- **Maximum developmental threshold**
  - Maximum temperature above which no growth will occurs

THERMAL CONSTANTS

- **Thermal constants** – Degree day accumulations for a certain stage of an insect's development
  - Differ for different life stages and between species



CALCULATING DEGREE DAYS

- **Average Method**
  - Use average temperature and compare to 50°F
  - Tends to underestimate DD's
  - **5 DD's** = (65+45)/2 - 50

CALCULATING DEGREE DAYS

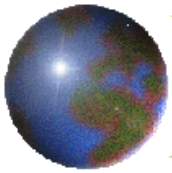
- **Modified Average Method**
  - Base temperature is substituted for minimum temperature
  - DD's = (Max Temp + Base Temp)/2 – Base Temp
  - **7.5 DD's** = (65+50)/2 - 50

CALCULATING DEGREE DAYS

- **Modified Sine Wave Method**
  - Even more accurate
  - Calculates area under temperature curve and above base temperature
  - Usually requires a computer

USING DD's IN PHC-IPM

- Timing of scouting for pest species
- Eliminates unnecessary scouting
- Avoids overlooking pest populations
- Aids in making better PHC-IPM decisions



SETTING UP A DD SYSTEM

- Identify and monitor phenological events
- Determine appropriate base temperature
  - **Usually 50°F for insects and 30°F for plants**
- Select starting date for DD accumulation
  - **Usually 1 March for a given year**
- Record daily max and min temps
- Calculate DDs using average or modified formulas
- Note corresponding phenological events with DD's
- Use DD values to predict events in future years

USING THE "COINCIDE METHOD" FOR PHC-IPM

- Developed by Mr. Don Orton, IDA
- Combines plant phenology, DD's, and insect development
  - Bud break
  - Flowering
  - Petal fall
  - Egg hatch
  - Larval feeding
  - Pupation
  - Adult emergence

END OF PRESENTATION