FIELD CALCULATIONS

Valen Straub, LABServices

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Field Calculations

- Where do we start?
  - Read the Protocol
    - Wealth of information

Test substance formulation

Plot size

Application equipment

Application rate

Adjuvant

Spray volume

Field Calculations

Test substance formulation

- **X-2009 0.4 EC**
  - 0.4
    - 1 gallon contains 0.4 pounds of ai (active ingredient) (or 48 grams of ai in 1 liter)
  - EC (Emulsifiable Concentrate)
    - First indication that you are dealing with a liquid

Field Calculations

- How do I know 0.4 pounds ai in 1 gallon equal 48 grams ai in 1 liter

Do the math…

Long way:

0.4 lb x 454 grams /lb = 181.6 grams

1 gallon x 3.785 liters/gallon = 3.785 liters

181.6 grams/3.785 liter x N / 1 liter = 48 grams / 1 liter

Shortcut:

0.4 x 120 (constant) = 48

Field Calculations

Plot size

- One untreated control (UTC) plot and treated plot(s)
  - Treated plots in tree studies will consist of a block of 6 consecutive trees
  - Applications will be made to both sides of the row

Field Calculations

Application equipment

- Air blast sprayer

Field Calculations

Application rate

- 18.14 grams ai (active ingredient)/A) or (0.04 lb ai/A)

Field Calculations

- Typically there are several ways that application rates may be listed:
  - **Amount of active ingredient per unit of area or per volume of mixture (In our case 18 grams ai/A or 0.04 lb ai/A)**
  - Amount of formulation per unit of area or per unit of volume (lb fp/A)
  - Amount of formulation per volume of mixture (pint/100 gallons of water)
  - Percentage of final dilution (% by volume or % by weight)

Field Calculations

Adjuvant

- No Crop Oil needed
  - Test substance will be applied alone

Field Calculations

Spray volume

- 100 GPA (gallons per acre)
  - Why is this information needed?
    - This is standard by which we need to calibrate the airblast sprayer
    - **Calibration** is how the airblast sprayer output is adjusted to reach the desired GPA
      - In our case 100 GPA, (+/- 5%) as per protocol requirement

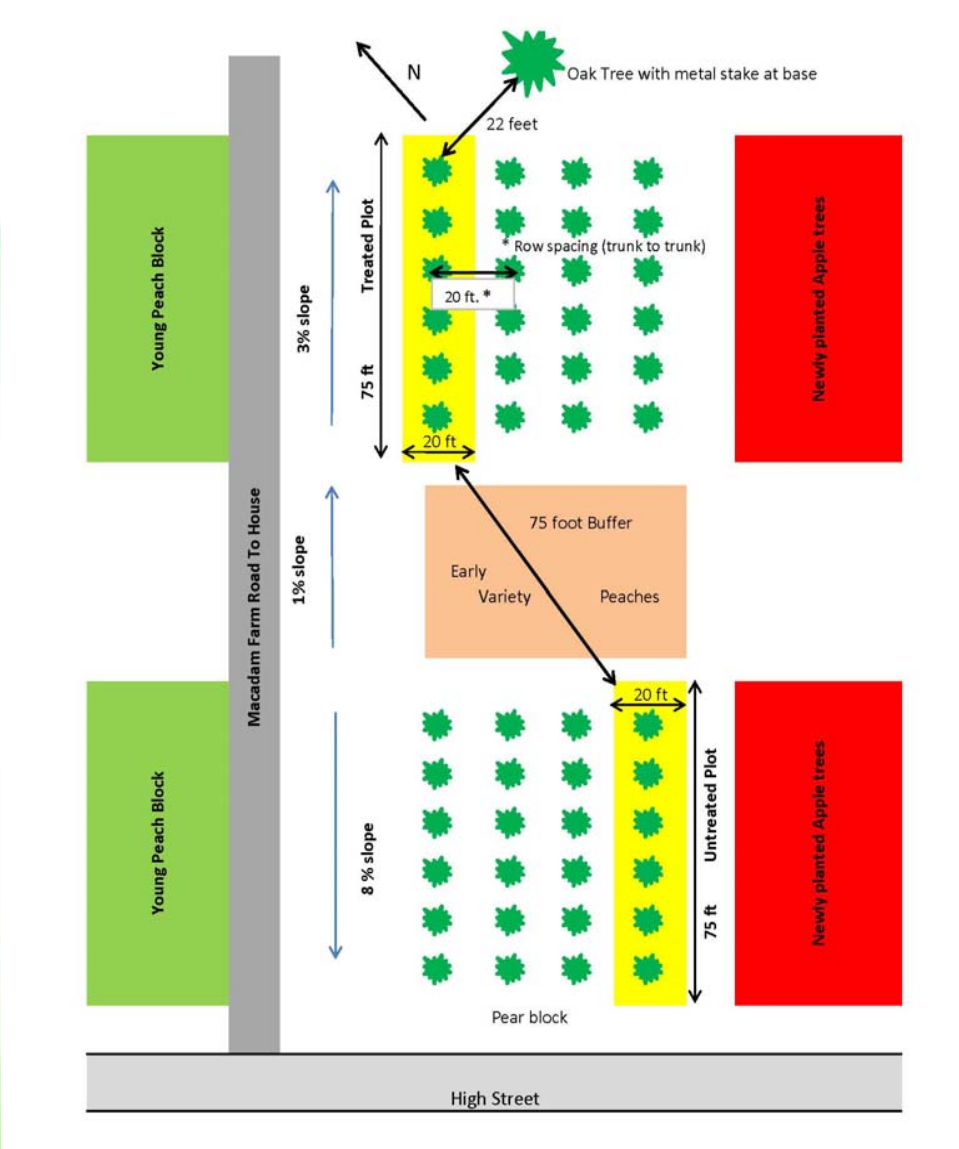
Field Calculations

- Are we ready to do the math now?

Not quite…

Field Calculations

- First order of business is to check the test plot
  - If time permits, run a tape measure and check plot length and width
  - If you don't have the time to measure, check the plot map carefully and make sure what you see listed on the map is what you see in the field



Field Calculations

- **Step 1:** Determine your Plot Area
  - Plot Width (ft) X Plot length (ft) of a treated area = Plot Area to be sprayed (ft. sq.)
  - In our case,
    - 20 ft X 75 ft = **1500 ft. sq.**
    - **1500 ft. sq.** ÷ 43560 ft. sq. /Acre = **0.034 Acres**
  - Estimate mix size based on protocol GPA (100 GPA)
    - 0.034 A X 100 GPA = 3.4 gallons (minimum mix size)
      - PI uses 5 gallons to calibrate equipment

Field Calculations

- **Step 1: Fill in the information on your calculation sheet**

LIQUID TEST SUBSTANCE CALCULATION SHEET

1 Gallon = 3785 mls or 3.785 Liters or 128 oz or 8 pints or 4 quarts

1 quart = 946 mls; 1 Pint = 473.2 mls; 1 ounce = 29.57 mls.

PLOT AREA:

plot width (ft) x plot length (ft) of a treated area = plot area to be sprayed (ft.sq.)

Step 1: 20 ft (w) ft X 75 ft (l) ft = 1500 ft. sq **ft. sq.**

plot area (**ft. sq.**) ÷ 43560 ft. sq. / Acre = **Plot Area (Acre)**

Step 2: 1500 ft. sq. / 43560 ft sq/A **ft. sq.** = 0.034 A **A (PLOT AREA)**

Field Calculations

- Pre-calibration inspection (what the PI should be looking at and QA should be aware of):
  - The spray tanks are clean
  - All hoses and fittings are sound
  - All screen and nozzles are clean
  - Tire pressure on the tractor is correct
  - Start the pump and set the tractor engine speed to the desired rpm

Field Calculations

- Pre-calibration inspection, *continued*:
  - Open the manifold valve to fill the lines and begin spraying
  - Adjust the pressure regulator and obtain the desired operating pressure
  - Check that each nozzle shut-off valve is working
  - Check that the agitation system is functioning properly
  - Search for and correct any leaks
  - Adjust the air stream, if needed

Field Calculations

- **Step 2: Calibrate the airblast sprayer**
  - Check SOP is available and accurate
    - Read the SOP so you are familiar with the calibration process
  - Calibrate the sprayer in an area that is representative of the plot area that will be sprayed.
    - Never calibrate a sprayer on a hard surface (such as pavement) which can induce errors as high as 15% compared to the field site
    - The location of the where the calibration spray flags are placed should be equal to the terrain in the treated area

Field Calculations

- **Step 2: Calibrate the airblast sprayer, *continued***
  - The airblast sprayer is filled with the correct amount of water and is ready for the start of the calibration spray runs
    - From the calibration worksheet - 5 gallons (18925 mls) is the amount of water being used for each calibration run

Field Calculations

- **Step 2: Calibrate the airblast sprayer, *continued***
  - What should you be looking for:
    - Closely watch the shut-off times and make sure the person timing the spray passes between the spray flags, starts and stops and the same location
    - Sprays should mimic actual spray
      - Protocol requires two sides of the tree to be sprayed
        - Spraying both sides of the tree is referred to as a full cover spray in commercial applications.
      - Is this being done in the calibration run?

Field Calculations

- **Step 3: Field Calculations**

  It's time to do some math!!!

  - Why is it important to apply the correct amount of X-2009 0.4 EC to the trial plot area?
    - If you apply too little pesticide you may not be fully controlling the pest
    - If you apply too much pesticide you may cause damage or injuries, leave illegal residues, and you can be fined or liable for damages

Field Calculations

- **Step 3: Field Calculations, *continued***

MIX SIZE:

* from the Calibration Worksheet: 101.16 **GPA** X 3.785 liters/gallon = 382.89 **LPA** (liters per Acre)

Step 1: **Plot Area** in acres (**A**) X **Spray Volume** (**GPA or LPA**) = minimum mix size needed for spray application

0.034 **A (PLOT AREA)** X 101.16 **GPA** = 3.44 **gallons** minimum mix size

0.034 **A (PLOT AREA)** X 382.89 **LPA** = 13.02 **liters** minimum mix size

Step 2: minimum mix size + 25% overage for boom fill and spray out = **mix size** volume

3.44 **gallons** (min. mix size) X 1.25 = 4.3 **gallons (MIX SIZE)**

13.02 **liters** (min. mix size) X 1.25 = 16.3 **liters (MIX SIZE)**

Field Calculations

- **Step 3: Field Calculations, *continued***

Liquid Rate Calculation of Active Ingredient:

Test Substance: X-2009 0.4 EC

Rate = **0.04** lb ai of active ingredient per 1 acre

Formulation = 0.4 lb of active ingredient per 1 gallon of formulated product

Step 1: $\frac{\text{Formulation (lbs of ai)}}{\text{1 gallon (or equivalent)}} \Rightarrow \frac{0.4 \text{ lb ai}}{\text{1 gallon}} \Rightarrow \frac{0.4 \text{ lb ai}}{\text{3785 mls}}$

Ready to convert rate of ai (active ingredient) to rate of formulated product/A

Field Calculations

Step 3: Field Calculations, *continued*

Liquid Rate Calculation of Formulated Product:

Step 2:

$$\frac{0.4 \text{ lb ai}}{3785^{*} \text{ mls}} \times \frac{0.04 \text{ lb ai/A}}{X \text{ mls}} = 378.5 \text{ mls of fp/A (Rate of formulated product (fp)/A)}$$

* by using 3785 mls instead of the 1 gallon, X will be solved in mls saving a conversion step

Step 3:

$$\frac{\text{rate fp/A (mls)}}{\text{spray volume (LPA)}} \times \frac{X \text{ (amount of product needed)}}{\text{mix size (liters)}} = X \text{ mls of Test Substance needed in } X \text{ Mix Size}$$

$$\frac{378.5 \text{ mls fp/A}}{382.89 \text{ LPA}} \times \frac{X \text{ (mls of Test Substance)}}{16.3 \text{ litre mix size}} = \frac{16.11}{16.3} \text{ mls of Test Substance in liters or } 4.3 \text{ gallons of water (Mix Size)}$$

Field Calculations

Any questions????

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