



CHAPTER 11



Pesticide Application Procedures

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National Pesticide Applicator Certification
Core Manual



CHAPTER 11

Select Appropriate Application Equipment

Selection criteria:

- ❖ Nature and habits of the pest.
- ❖ Characteristics of the target site.
- ❖ Suitability of the equipment.
- ❖ Cost and efficiency of alternate methods.

Application Methods

- ❖ **Spot**—application of a pesticide to a small area



Application Methods

- ❖ **Foliar**—directs pesticides to the leafy portions of the plants.



Application Methods

- ❖ **Space treatment**—application of a pesticide in an enclosed area



Application Methods

- ❖ **Soil incorporation**
the use of tillage, rainfall, or irrigation equipment to move pesticide into the soil
- ❖ The example shown is a 'flood floor' in a greenhouse where pesticide is being applied with irrigation water



Willoway Gardens

Application Methods

- ❖ **Band**—applying a pesticide in parallel strips or bands such as between rows of crops rather than to an entire field



Application Methods

- ❖ **Crack and crevice**—placing small amounts of pesticide into cracks and crevices in buildings to control structural pests



Pre-Empt™

Professional Cockroach Gel Bait

ACTIVE INGREDIENT:

| | |
|--|---------|
| Imidacloprid, 1-[(6-Chloro-3-pyridinyl)methyl]-N nitro- 2-imidazolidinimine..... | 2.15% |
| INERT INGREDIENTS..... | 97.85% |
| | 100.00% |

EPA Reg. No. 3125 - 525 Five 30-gram Tubes Per Box,
10 Boxes Per Case

**STOP - Read the label before use.
Keep out of reach of children.**

CAUTION

PRECAUTIONARY STATEMENTS HAZARDS TO HUMANS AND DOMESTIC ANIMALS

CAUTION: Causes moderate eye irritation. Avoid contact with eyes or clothing. Wash thoroughly with soap and water after handling.

FIRST AID

If Swallowed: Call a physician or Poison Control Center.

SPOT OR CRACK AND CREVICE APPLICATIONS

Spot treatments: PRE-EMPT should be applied as spots or droplets of approximately 4 to 6 mm in diameter. Approximately 10 droplets per 100 sq. ft. is recommended for use under conditions with low to moderate insect infestations. Approximately 20 droplets per 100 sq. ft. is recommended for more severe infestations or where the population occurs in inaccessible locations, such as in wall voids. Under most circumstances, more numerous, smaller bait placements will provide faster and more effective control than fewer large placements.

Crack and Crevice Treatments: PRE-EMPT may also be applied as a bead or thin film where appropriate. Bait should be applied into cracks and crevices in which insects hide or through which they may enter the building. Such openings commonly occur at expansion joints, between different elements of construction, between, behind or under various types of equipment such as cabinets, refrigerators, sinks, stoves, dishwashers, and through floors, doors, windows, walls and ceilings. These openings may lead to voids such as hollow walls, hollow equipment legs and bases, utility entrances, electrical conduit, junction and switch boxes, and wall and floor drain exits. Trapping techniques or spot flushings will aid in determining areas with insect activity.

Application Methods

- ❖ **Tree/stem injection**
the application of pesticides under the bark of trees



Tree Health Management

Types of Safety Systems

- ❖ Safety systems are used to protect either the applicator or the environment.
- ❖ Three types of systems:
 - ❖ Closed mix/load systems
 - ❖ Pesticide containment pads
 - ❖ Enclosed cabs

Closed Mixing and Loading Systems

- ❖ Prevent human contact with pesticides while mixing or loading
- ❖ Benefits
 - ❖ Increase human safety
 - ❖ Reduce need for PPE
 - ❖ Decrease likelihood of spilling
 - ❖ Accurately measure pesticide



Closed Mixing and Loading Systems: Mechanical Systems

All in one system

- ❖ Remove pesticide product from container
 - ❖ by gravity or suction
- ❖ Rinse pesticide container
- ❖ Transfer pesticide and rinse solution to tank without being exposed to pesticide!





Closed Mixing and Loading Systems: Mechanical Systems

- ❖ Product specific
- ❖ Mini-bulk containers
 - ❖ 40-600 gallons
 - ❖ Pump, drive and meter units deliver accurate amount from mini-bulk container to sprayer
 - ❖ Refill containers – eliminates waste

Closed Mixing and Loading Systems: **Water-soluble packaging**

- ❖ Easy system
- ❖ Unopened pesticide package is dropped into the mix tank
- ❖ Bag dissolves and pesticide is released into the tank



Enclosed Cabs

- ❖ May prevent exposure to pesticides if sealed correctly
- ❖ Supplement to PPE but not a replacement
- ❖ Consider cab contamination issues



Pesticide Containment System

Containment Pad

- ❖ Catch spills, leaks, overflows and wash water
- ❖ Prevent environmental contamination
- ❖ Impermeable material (sealed concrete, synthetic liners, glazed ceramic tile, etc.)
- ❖ System for recovering and removing material



Hydraulic sprayers

- ❖ Low pressure sprayers
 - ❖ 15-80 PSI
 - ❖ Do not deliver sufficient coverage for some insecticides and fungicides
- ❖ High pressure sprayers
 - ❖ Can deliver up to 50 gallons per minute
 - ❖ Can operate at pressures up to 800 PSI

Application Equipment

Air-blast sprayer

- ❖ Mist
- ❖ Uses air and water as the carrier



Ken Giles, UC Davis

Sprayer Components

❖ Tank

- ❖ Non-corrosive and easily cleaned
- ❖ Opening top and bottom for ease in filling and cleaning



❖ Tank Agitator

- ❖ Provides continuous mixing of pesticide and carrier

Sprayer Components

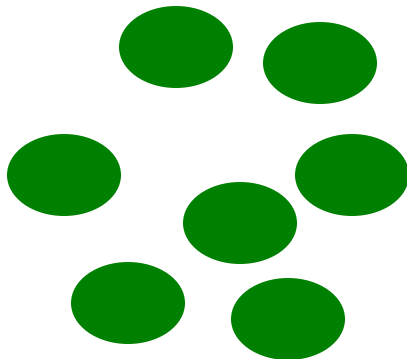
❖ Nozzle

- ❖ Amount of material applied
- ❖ Orifice size => droplet size
- ❖ Distribution and droplet pattern



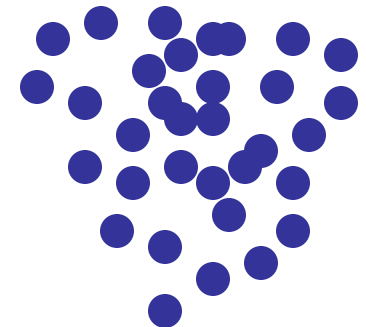
Coarse droplets

-minimize off-target drift



Fine droplets

-maximum surface coverage



Spray Component Nozzles

- ❖ Nozzle performance depends on:
 - ❖ Nozzle design of type
 - ❖ Size of the spray tip
 - ❖ Operating pressure
 - ❖ Discharge angle
 - ❖ Distance between the nozzle and the target
- ❖ Size of the **orifice** (opening) affects **droplet size and flow rate**

Spray Component Nozzles

- ❖ Material selection
 - ❖ Brass and aluminum – don't use with abrasive material e.g. wettable powders
 - ❖ Hardened Stainless Steel
 - ❖ Ceramic
- Best if used with wettable powders and dry flowables

Avoid application problems and replace all worn nozzles



Application Equipment

- ❖ Granular Applicators

- ❖ Band or broadcast

- ❖ Application rate affected by

- ❖ Ground speed

- ❖ Gate opening

- ❖ Granule size, shape, and density

- ❖ Terrain and weather conditions



Granular Applicators

Rotary Spreader

- ❖ Spinning disk or fan
- ❖ Heaviest granules thrown farther



Drop Spreader

- Gravity
- More precise application

Chemigation

- In 1987 MDA put **chemigation** regulations into effect for pesticides—in 1989 regulations were expanded to include fertilizers.
- MDA Chemigation regulations were expanded include application of fertilizers through irrigation systems—*fertigation*.
- **MDA chemigation regulations include:**
 - ❖ **Obtaining a permit**
 - ❖ **Fee**
 - ❖ **Installing antipollution and safety devices**
 - ❖ **Complying with MDH well separation distance (150 feet)**

Example of Reduced Pressure Backflow (RPZ) Preventer



Credit: Conbraco

<http://www.conbraco.com/products/backflow/indexbac.html>

Equipment Calibration

- ❖ Calibration—the process of measuring and adjusting the amount of pesticide to a specific area.
- ❖ The **application rate** of a sprayer is affected by:
 - ❖ Travel speed
 - ❖ Nozzle (orifice) size
 - ❖ Sprayer pressure

Oh no, Math!

- ❖ Equipment calibration and application requires basic math skills
- ❖ Remember, you can always refer to manuals for formulas but you need to know how to use the formulas



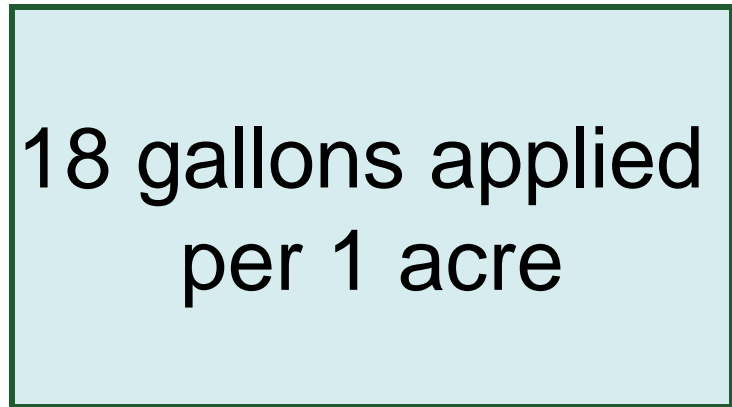
Equipment Calibration

What is meant by calibrating equipment?

Determine **volume applied per area**

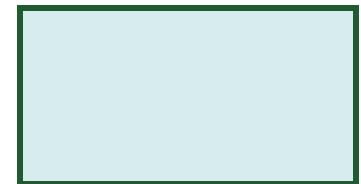


13 ounces applied
per 1,000 sq. ft



equivalent to:

0.18 gals applied
per 435.6 sq. ft





Equipment Calibration

Why is calibration important?

- ❖ Adjust equipment to get desired rate
- ❖ Achieve label rate for product delivery
 - ❖ Meet application volume requirements
 - ❖ Effective pest control
 - ❖ Does not waste money
 - ❖ Does not violate the pesticide label
- ❖ Personal and environmental safety

Equipment Calibration

- ❖ Inaccurate application:
 - ❖ Too little pesticide and you may fail to control the pest
 - ❖ Too much pesticide and:
 - ❖ You are violating the label
 - ❖ You may damage the plants (phytotoxicity)
 - ❖ You are wasting money

Equipment Calibration

❖ Calibrate based on label rates

❖ Acre

❖ 1000 sq.ft.

❖ 100 sq.ft.

❖ 100 gallons

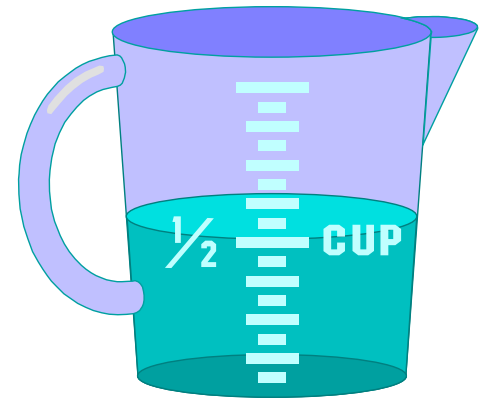
❖ For accuracy, use the area stated

❖ Can use smaller unit area and covert, but you lose some accuracy

| Crop Use Recommendations | | |
|---|--|---|
| Alfalfa: | | |
| Insects Controlled | Rate of Application | Method of Application |
| For control of Grasshoppers | $\frac{1}{4}$ to $\frac{1}{2}$ pint per acre | Apply as a foliar spray when insect populations and/or damage reaches economic thresholds, refer to Cooperative Extension Pest Management Guidelines. Minimum gallonage requirements. Ten gallons of finished spray per acre with ground equipment, two gallons per acre with aircraft. |
| For control of Alfalfa Blotch Leafminer and Potato Leafhopper | 1 to 2 pints per acre | |

Equipment Calibration

- ❖ Equipment is calibrated by making a trial run on some premeasured area and measuring the output.
- ❖ Tools needs:
 - ❖ Measuring tape, markers
 - ❖ Stopwatch
 - ❖ Scale or container with graduated volume
 - ❖ Tarp (granular)



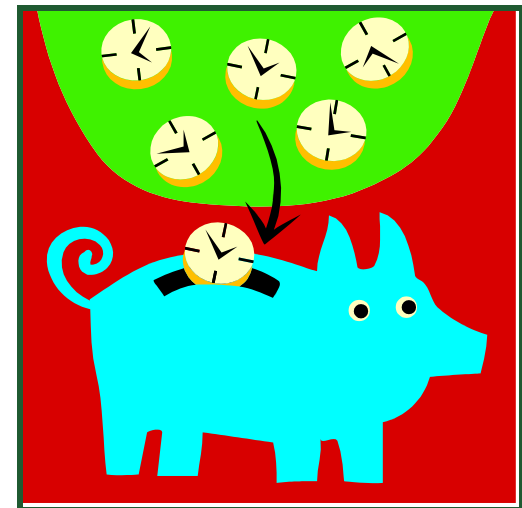
Equipment Calibration

How often should you calibrate?

- ❖ Periodically
 - ❖ Any change in equipment set up
 - ❖ Whenever change products

Calibration is important

Take the time to do it
right and often



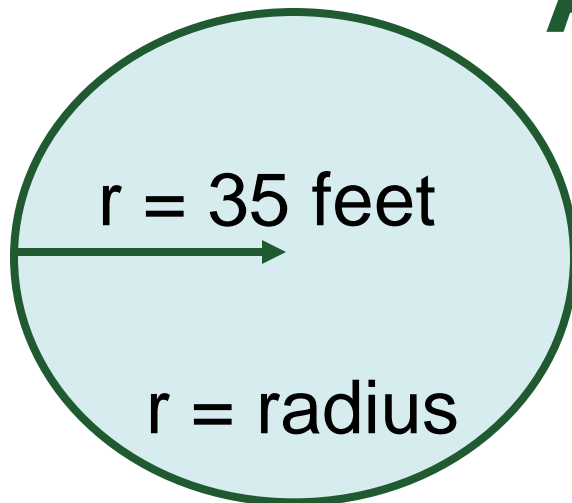
Area of Square/Rectangle



$$\text{Area} = \text{Length} \times \text{Width}$$

$$125 \times 40 = 5,000 \text{ sq.ft.}$$

Area of Circle



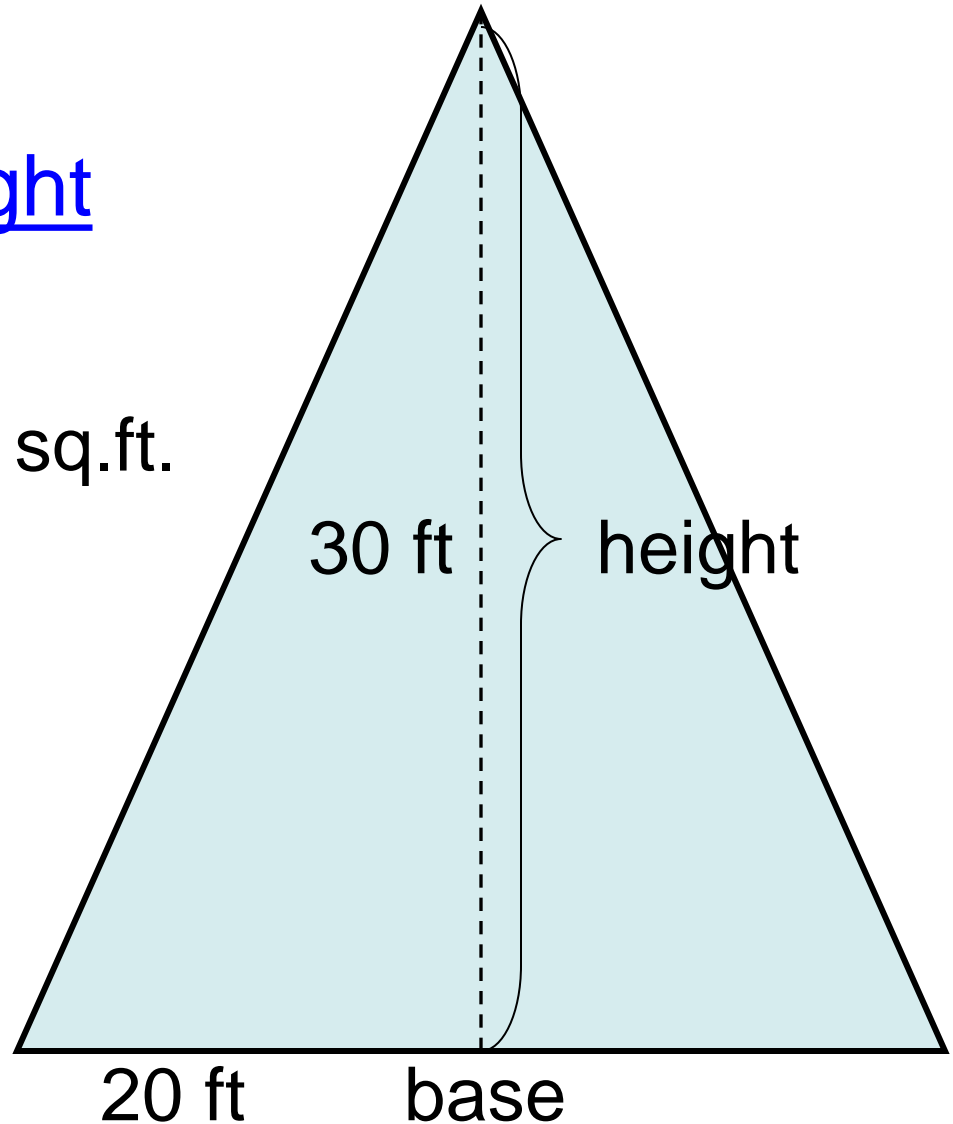
$$\text{Area} = 3.14 \times r^2$$

$$3.14 \times 35 \times 35 = 3,846.5 \text{ sq.ft.}$$

Triangular Areas

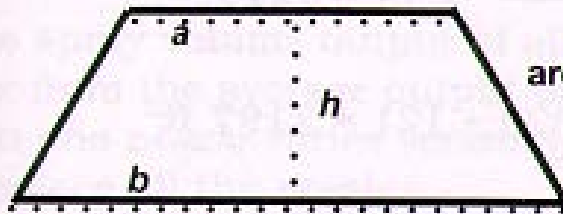
$$\text{Area} = \frac{\text{base} \times \text{height}}{2}$$

$$\text{Area} = \frac{20 \times 30}{2} = 300 \text{ sq.ft.}$$



Calculate the Target Area Area of a Trapezoid

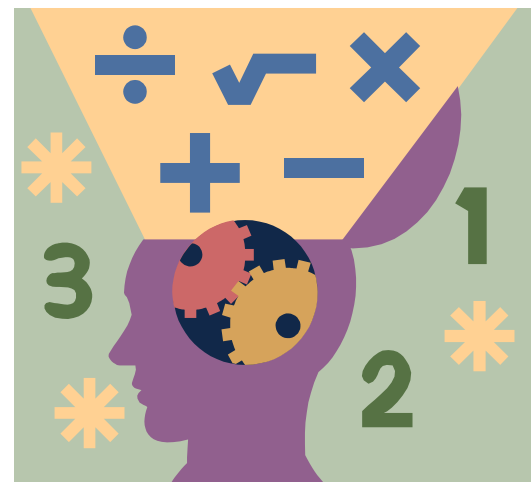
If the site is a trapezoid shape, multiply the average length of the parallel sides $(a + b)/2$ by the height (h).



$$\text{area} = \frac{a + b}{2} \times h$$

Determining Application Rate

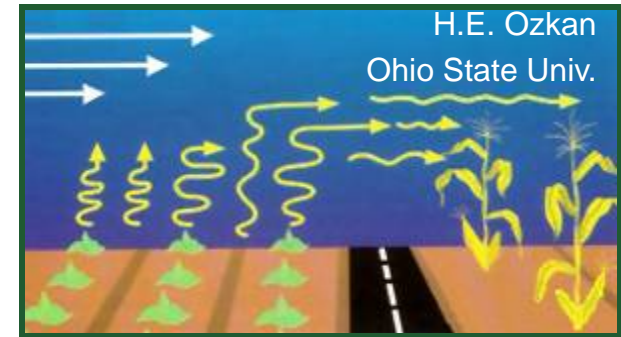
- ❖ Follow your units
 - ❖ 1000 square feet, acres
 - ❖ Gallons, quarts, pints, ounces
 - ❖ Ounces, pounds
 - ❖ Pounds of active ingredient




Read the Label
and
Watch Math Units!

Minimizing Drift

- ❖ Read the Label
 - ❖ Volatility
 - ❖ Equipment restrictions
 - ❖ Droplet size restrictions
 - ❖ New technology
- ❖ Buffers
- ❖ Wind direction/speed
- ❖ Temperature Inversions



|  | PSI | | | | |
|---|-----|----|----|----|----|
| | 29 | 36 | 44 | 51 | 58 |
| DG95015E | M | M | F | F | F |
| DG9502E | C | M | M | M | M |
| DG9503E | C | C | M | M | M |
| DG9504E | C | C | C | M | M |

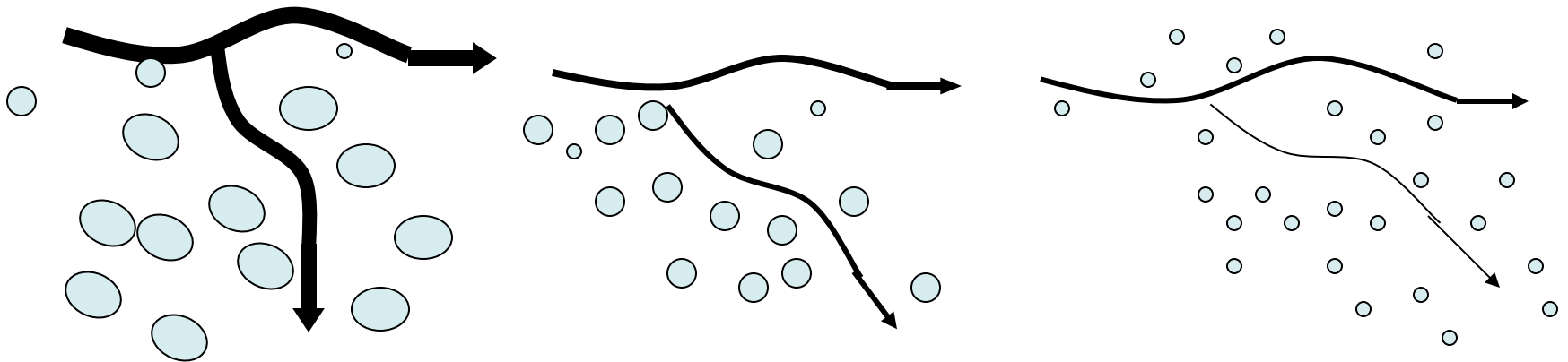
Minimizing Drift

- ❖ Drift variables
 - ❖ Application equipment
 - ❖ Type of nozzle
 - ❖ Nozzle size and pressure
 - ❖ Sprayer speed – unstable boom
 - ❖ Distance from sprayer to target site
 - ❖ Drift adjuvants
 - ❖ Weather assessment



Minimizing Drift: Type of Nozzle

- ❖ Drift reduction nozzles
- ❖ Larger droplets are less likely to drift = larger orifice
- ❖ Read the label



Spray Efficacy

Water/Oil Sensitive Paper



Syngenta



Minimizing Drift

Distance from target site

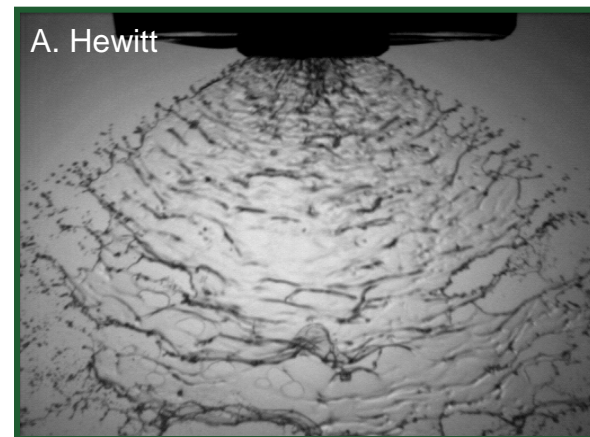
Reducing the distance a droplet must fall before hitting the target site, reduces drift potential



Minimizing Drift

Spray Adjuvants

- ❖ Several drift reduction adjuvants on the market---some can reduce drift 50-80%
- ❖ Evaluate to ensure you get drift reduction





Techniques for Reducing Spray Drift

- ❖ Label instructions
- ❖ Select nozzle for smaller droplet size
- ❖ New tech nozzles
- ❖ Lower boom height
- ❖ Keep nozzle close to target with hand held equipment
- ❖ Avoid applying in high ground winds
- ❖ Do not spray during temperature inversions
- ❖ No-spray buffer zones for sensitive sites
- ❖ Use drift-control additive

Take the time to calibrate!

- ❖ Every sprayer needs to be calibrated
- ❖ Make sure applying correct amount of product
- ❖ Be a responsible pesticide applicator

