Pesticide Safety Education & UGA + Formulations for Mosquito Control Products

Dr. Mickey Taylor, UGA PSEP Associate Coordinator
(706) 540-4108  mickeyt@uga.edu
Background

• Practical experience
  – 20 years as mid-sized greenhouse grower/owner-operator

• Training
  – Graduate education in environmental toxicology esp. pesticides

• Research experience
  – Commercial nursery contaminant remediation using constructed wetlands

• Business & government experience
  – Research Director, InsectiGen Inc. – Bt enhancement product
  – USDA Senior Agricultural Advisor with the Civilian Response Corps
PSEP Accomplishment Timeline

- **April** — GA Dept. of Agric. (GDA) setting priorities
- **June** — meet Southern Region PSEP Coordinators
  - Agent training, commercial and private applicator training, recertification talks
  - 3-yr $75,000 PSEP-IMI Goal 1 grant for PSEP sustainability
- **August** — GDA approved Private Applicator’s training manual
  - PSEP website designed
  - PSEP advisory committee established
- **Sept.** — launched new Pest Management Handbook website
  - PSEP website content approved by GDA
  - Chapters 1-8 of Private Applicator Manual PowerPoints to GDA
Ongoing PSEP Projects

- Publish Private Applicator’s Manual — priority of GA Dept. of Agric.
- PSEP website — launch
- PowerPoint training presentations — Private Applicator’s Manual
- Pest Management Handbook redesign
- Establish online publication store
- PSEP publication sales to for-profit business basis
- Pay-as-you-go for PSEP sustainability
Now, a word or two about formulations ...
First, A Pesticide Formulation Is:

active ingredient (a.i.)
  each a.i. will be listed

+ 

inert ingredients

water, solvents, dry carrier material,
  stabilizers, dye, & surfactants: spreaders, stickers,
  emulsifiers, wetting agents
Why Do Manufacturers Add Inert Ingredients?

- Pesticide product handling is easier
- Inerts make for easier measuring and mixing
- Improve pesticide safety
- Makes a.i.(s) work better
  - Better penetration
  - More selectivity
  - Increased effectiveness
Types of Spray Mixes:
How does it really mix in the spray tank?

- **Solution**
  - Sugar water

- **Suspension**
  - Hot cocoa
  
  Active Ingredient (high %) dry carrier mixed with an emulsifier

- **Emulsion**
  - Whole milk
  - Oil & vinegar dressing

  a.i. is dissolved in oil and mixed with an emulsifier
Liquid Formulations

Ultra-Low Volume (ULV)

- Special-purpose formulation
- Almost 100% active ingredient
- Agriculture, forestry, and
- Heavily used for mosquito control
Application Methods
As Thermal or Cold Fog Aerosols

- Difficult to confine
- High drift potential
  - Low wind speed
  - Inversion layer
- Highly specialized equipment
- Respiratory protection needed
- Indoor and outdoor use
Liquid Formulations
Ultra-Low Volume (ULV)

**ADVANTAGES**
- Easy to handle
- Little or no agitation
- Easy on equipment
- No residue
- Used indoors/outdoors
- Application equipment usable with some other formulations

**DISADVANTAGES**
- High drift hazard
- Specialized equipment needed
- Solvent wear on rubber and plastic
- Regular calibration critical
Liquid Formulations

Emulsifiable Concentrate (E or EC)

Active ingredient (liquid) dissolved in a petroleum-based solvent with an emulsifier added.

- **product**: Turns white when mixed.
- **diluted**: Smells of solvents.
Liquid Formulations

Emulsifiable Concentrate (E or EC)
High % a.i.

**ADVANTAGES**
- Easy to handle
- Little agitation
- Relatively easy on equipment
- Leaves little residue

**DISADVANTAGES**
- Phytotoxic – plant injury
- Handlers/loaders extra PPE
- Easily absorbed by the skin
- Flammable
- Can deteriorate rubber and plastic hoses
Liquid Formulations

Flowables (F)

Flowables are basically a wettable powder pre-mixed with a liquid carrier

product
diluted
Liquid Formulations
Flowables (F)

ADVANTAGES

• Easy to handle
• Easy to measure/mix
• No inhalation hazard
• Less absorption by human skin and eyes
• No phytotoxicity
• Easier on surfaces

DISADVANTAGES

• Some agitation required
• Abrasive to pumps and nozzles
• Visible residues
Dry Formulations

- Buy Dry ---> Mix with water ---> Spray
- Includes:
  - Wettable Powders (WP)
  - Water Dispersible Granules (WDG)
  - Dry Flowables (DF)

Active Ingredient (high %)
Dry Carrier
Emulsifier (slick, soapy)
Dry Formulations

Wettable Powders (WP or W)

Wettable powders settle out quickly, therefore require constant agitation in the spray tank.
Dry Formulations

Wettable Powders – high a.i. %

**ADVANTAGES**

• Easy to store
• Easy to measure/mix
• Relatively less harmful to plants, animals and surfaces than ECs
• Less absorption by human skin and eyes

**DISADVANTAGES**

• Inhalation hazard
• Constant agitation
• Difficult to mix in hard water
• Abrasive to pumps and nozzles
• Visible residues
Dry Formulations

Water-dispersible Granules (WDG) or Dry Flowables (DF)

These materials possess some of the same characteristics as wettable powders except they are formulated into granular-sized particles, so are easier to handle with little inhalation hazard.
Dry Formulations

Soluble Powders – (SP or WSP)

**ADVANTAGES**
- high a.i. % (15-95% by weight)
- Easy to measure/mix
- Form true solution (no agitation)
- Little phytotoxicity concern
- Less absorption (dermal or eyes)

**DISADVANTAGES**
- Inhalation hazard
- Few products available
Other Formulations

- Microencapsulated
  - High toxicity a.i. in encased formulation
- Water-soluble packets
  - No human exposure when mixing
- Briquettes or soluble granules
  - Relatively long lasting
Selecting a Pesticide Formulation

• What are the advantages and disadvantages of a particular formulation?
• Do I have the right application equipment?
• Can I apply the formulation safely when and where it is needed?
• Will the formulation reach my targeted pest and be there long enough to kill or control it?
• Will the formulation pose an unacceptable risk to nontarget species or the environment?
• Does its cost fit within my budget constraints?
Adding Adjuvants?

• Term basically means additive
  – Sold separately to mix with product when tank mixing

• Labels will often recommend adding an adjuvant

• Includes surfactants, spreaders, wetting agents, colorant dyes, buffers, antifoaming agents, safeners, etc.
Adjuvants
(purchased to add to tank mixes)

**Surfactant group**
- Wetting agents
- Spreaders
- Emulsifiers
- Stickers/Extenders

**Other adjuvants**
- Buffers
- Compatibility agents
- Defoaming agents
- Colorants/dyes
- Safeners
- Thickeners
Adjuvants
Guideposts for choosing the correct one…

• Read the pesticide label for recommendations
  – Some may prohibit use of an adjuvant
• Don’t use industrial products or household detergents
• Test before you spend $$
• Remember, many pesticide products already contain an adjuvant(s)
Questions?