

Pesticide Safety Education & UGA **+** **Formulations for Mosquito Control Products**

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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?

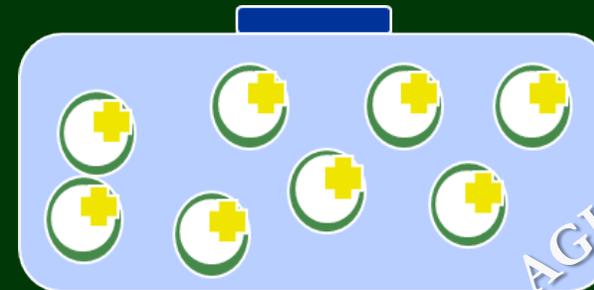
- Solution
 - Sugar water

liquid or dry formulations



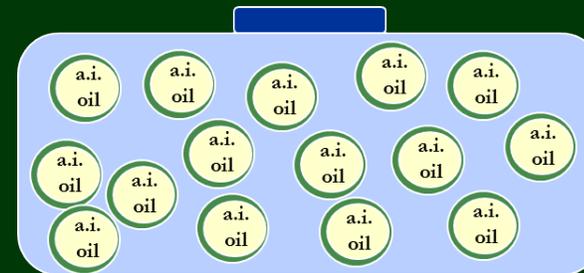
- Suspension
 - Hot cocoa

Active Ingredient (high %) dry carrier mixed with an emulsifier



AGITATION
REQUIRED

- 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

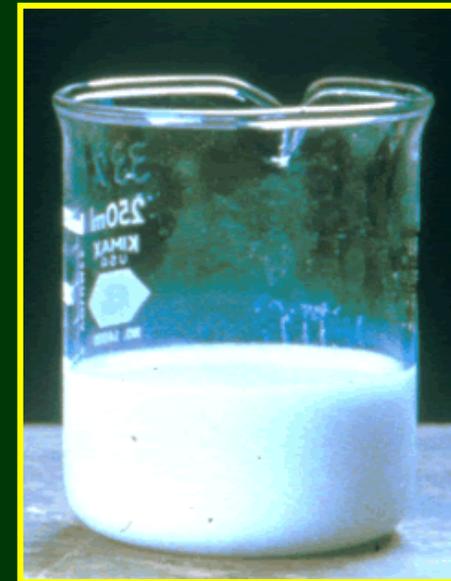
product



Turns
white
when
mixed

Smells of
solvents

diluted



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



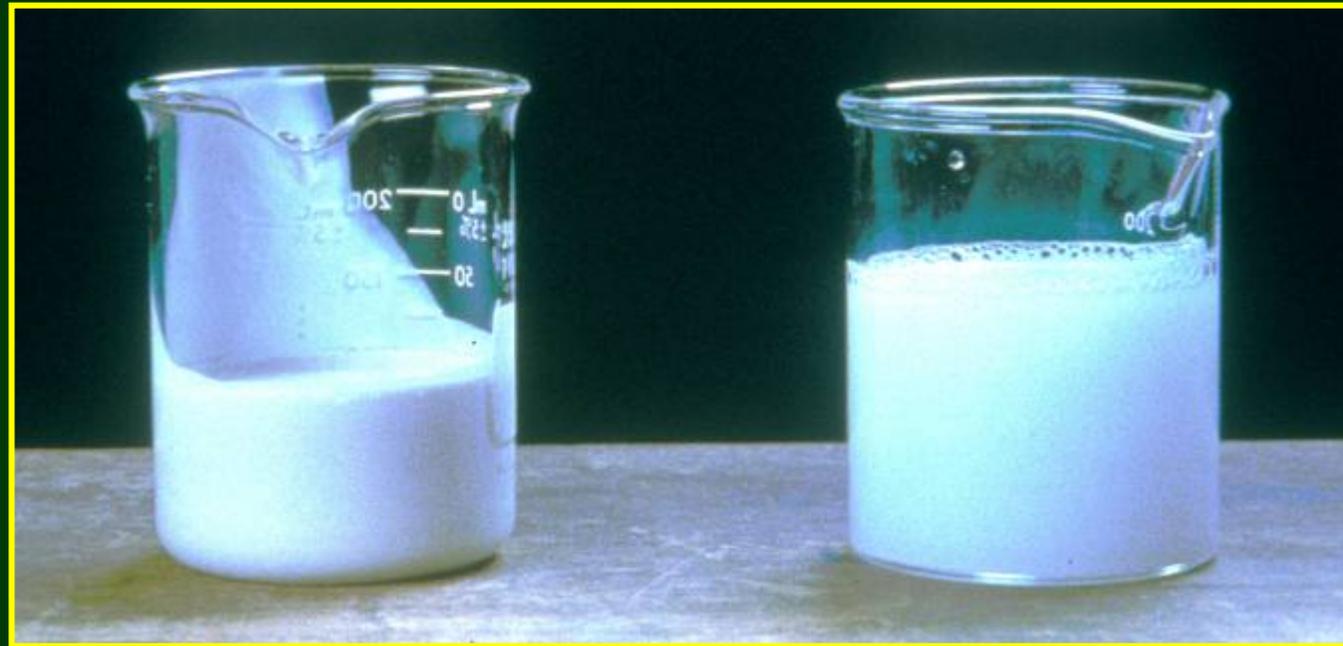
Liquid Formulations

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

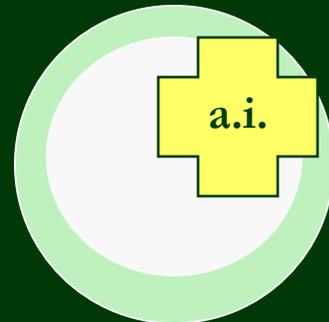


Dry Formulations

- 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

product

diluted



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

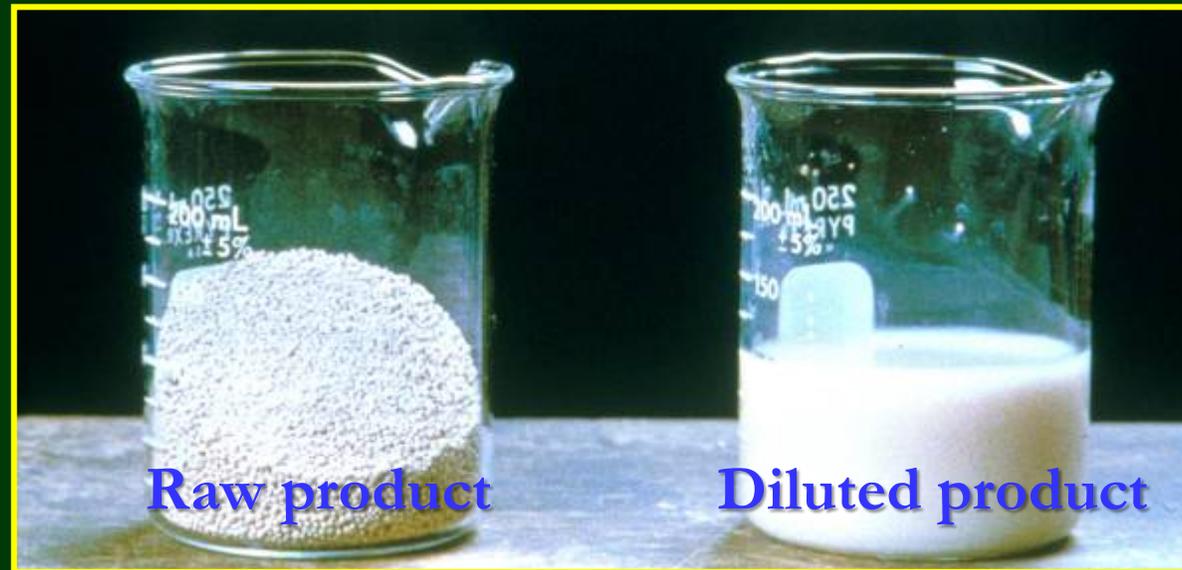
- Inhalation hazard
- Constant agitation
- Difficult to mix in hard water
- Abrasive to pumps and nozzles
- Visible residues



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)

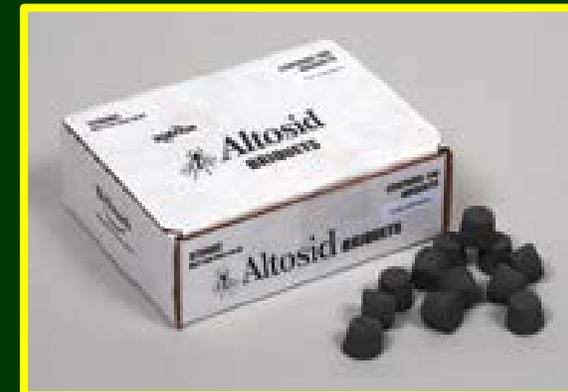
DISADVANTAGES

- Inhalation hazard
- Few products available



Other Formulations

- Microencapsulated
 - High toxicity a.i. in encased formulation
- Water-soluble packets
 - No human exposure when mixing
- Briquets 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

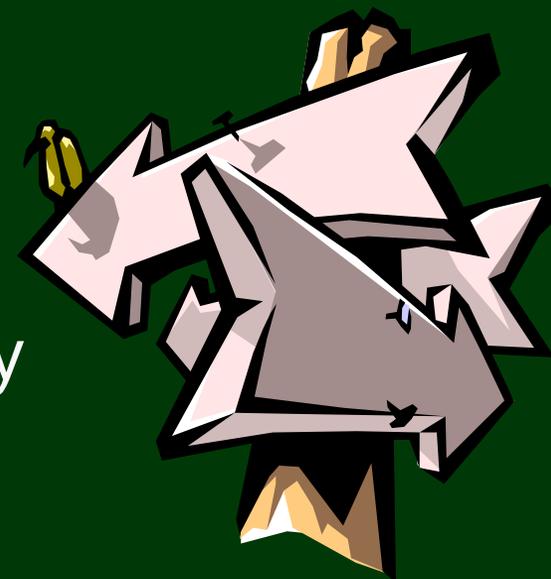
Buffer Extra Strength™



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?

