



Pesticides

Any substance or mixture that is a pesticide

Any substance intended for pest poisoning



Making Pesticide Use Decisions

- Health codes require control
- Persons tolerance levels
- Action thresholds
- Environmental conditions
- Suppression indicators are
 - Inoculum sources
 - Favorable conditions for development
 - History of disease infection



Factors Influencing Pesticide Use

- Potential for air pollution and groundwater contamination.
- Protecting endangered species
- Handler, packer, processor restrictions
- Handler training costs
- Requirements to protect workers
- Compatibility of REI and PHI
- Limitations imposed by plant-back restrictions.



Selecting the Right Pesticide

- Pesticide label books
- Farm advisors and Ag commissioners
- PCA's
- UC publications, treatment guides, PMG's
- www.ipm.ucdavis.edu/PMG

Pesticide Persistence

- Affects residues, off-target movement, and longevity of AI
- Persistence is it's half life
- WP have a longer persistence than EC's
- pH if high, breaks down chemicals quickly
- Porous surfaces increase persistence
- Soil microorganisms break down chemicals

Cost and Efficacy of Pesticides

- Cost of product does not equal efficacy
- Cost per lb. AI /cost per unit area treated
- Weather conditions affect efficacy
- Pest susceptibility
- Damage to natural enemies
- Compromises are often made and personal experience often needs to be valued.



Other Factors to Consider

- Ease of use and compatibility with other materials.
- Effects on beneficial insects and natural enemies.
- Restricted- entry intervals and harvest limitations.

Selective Pesticides

- Refers to a range of organisms affected by a pesticide. Controlled by factors:
 - The penetration rate through an organism's outer body covering (or the cuticle of plant tissue)
 - The speed at which the toxicant is excreted by organisms
 - How the toxicant binds to tissues of different organisms



The Selective Use of Pesticides

- Application timing
- Application techniques
- Dosage levels
- Types of formulations
- Adjuvants
- Ability to keep the pesticide on target



Important Application Techniques

- Equipment operation
- Preventing gaps or overlaps
- Spot treatments
- Band Treatments
- Treating alternate rows or blocks
- Low-volume applications
- Pesticide dosage level
- Type of formulation used
- Adjuvants



Keep the Pesticide on Target

- Skill of the operator
- Application equipment used
- Droplet size of the spray being used
- Operating pressure of the sprayer
- Physical properties of the pesticide formulation
- General weather conditions
- Unique local weather conditions (microclimates)

Follow-Up Monitoring

■ Amount of pesticide used:

1. Calculated amount required for job:_____
2. Actual amount used:_____
3. Variation – divide (1) by (2) then multiply by 100. Subtract answer from 100 (this should be between +10 and – 10)_____

■ Coverage:

1. Uniform_____, or uneven_____
2. Runoff?_____, Penetration into all areas?_____

■ Effectiveness:

1. Target pests controlled or reduced below economic injury level?_____
2. Condition of natural enemies:_____, Secondary pest

Pesticide Toxicity

- The ability of the chemical to cause injury, and is measured by the following:
- LD₅₀ (Lethal Dose)
- LC₅₀ (Lethal Concentration)
- NOEL (No Observable Effect Level)
- TLV (Threshold limit Value)

LD₅₀ (Lethal Dose)

- This is the dose that kills 50% of a test population.
- The smaller the LD₅₀ the more toxic or hazardous a chemical.
- Expressed as a (mg) of pesticide per (kg) of body weight of the test animal (mg/kg).
- Both Oral and Dermal tests are conducted.

LC₅₀ (Lethal Concentration)

- Expressed as micrograms (1/1.000,000g) per liter of air or water.
- Determining vapors or dust in the air, or dilutions of pesticides in rivers, streams, or lake water.



NOEL (No Observable Effect Level)

- The maximum dose or exposure level of a pesticide that produces no noticeable toxic effect on test animals.
- Used as a guideline for exposure limits for humans.
- The EPA sets the levels at 100 to 1000 times less than the NOEL.



TLV (Threshold Limit Value)

- This is the airborne concentration in parts per million that produces no adverse effects over time.
- Application is for chemicals used as Fumigants.
- The TLV protects workers who are exposed for 8 hours per day for 5 consecutive days.

Toxicity Classification

- Danger (Category 1)
- Warning (Category 2)
- Caution (Category 3)



Types of pesticides

- Acaricide kills mites
- Algaecide kills algae
- Attractant attracts pests
- Avicide kills birds
- Bactericide kills bacteria
- Defoliant removes plant foliage
- Desiccant removes water from arthropod pests
- Fungicide kills or suppresses fungi
- Growth Regulator regulates animal or plant growth
- Herbicide kills weeds
- Insecticide kills insects
- Molluscicide kills snails or slugs
- Nematicide kills nematodes
- Piscicide kills fish
- Predacide kills mammal predators
- Repellent repels animals or invertebrates
- Rodenticide kills rodents
- Silvicide kills trees and woody shrubs



Pesticide Chemical Groups

- The pesticide chemical groups are based on common characteristics such as mode of action, chemical structure, formulation types, and persistence issues

Insecticides

- A pesticide used for the control of insects



Organochlorines

- (Chlorinated hydrocarbons) used as the first synthetic chemicals for mites and insects. Most were extremely toxic to humans and wildlife. DDT is of this group.



Organophosphates

- Organic molecules containing phosphorous. Highly toxic to people, but break down quickly in the environment.





Carbamates

- N-methyl carbamate insecticides, miticides, and nematicides are cholinesterase inhibitors

Herbicides

- A pesticide used for the control of weeds.



Fungicides

- A pesticide used for control of fungi.



Antibiotics

- A substance produced by a living organism, such as fungus, that is toxic to other types of living organisms.



Anticoagulants

- A type of rodenticide that causes death by preventing normal blood clotting.



Botanicals

- Are derived from plants or plant parts.



Inert Dusts or Dessicants

- A material that removes water from plants or arthropods or destroys the waxy coatings that protect these organisms from water loss. These are also used for weed control and to defoliate certain plants before harvest.



Insect Growth Regulators (IGR)

- Controls certain insects by disrupting the normal process of development from immature to reproductive life stages.



Microbials

- Chemicals that consist of bacteria, fungi, or viruses used to control weeds, invertebrates and sometimes vertebrates.

Petroleum Oils

- These are used primarily to suffocate plant feeding pests. They also destroy weeds by injuring cell membranes.



Pheromones

- A chemical produced by an animal to attract other animals of the same species.





Plant-Growth Regulators (PGR)

- A pesticide used to regulate or alter the normal growth of plants or the development of plant parts.

Soaps

- Pesticide soaps control insects, mites, mosses, liverworts, algae, and lichens by interfering with cellular metabolism of the target pest. Most effective on soft bodied insects such as aphids, scales, psyllids. These are primarily nontoxic to vertebrates.
- They can however cause damage to some plants so read the label.

Factors influencing Reactions to Pesticides

- Mode of Action (local or systemic)
- Life Stages
- Pesticide Uptake



Common Pesticide Formulations

- Are raw chemicals added to substances that improve effectiveness, safety, handling, and storage. These consist of the following:
 - Active ingredient
 - The carrier (organic solvents or mineral clay)
 - Surface-active ingredients
 - Other ingredients such as stabilizers and dyes



Wettable Powders (W or WP)

- These are active ingredients that will not dissolve in water, combined with a mineral clay and other inert ingredients and are ground into a fine powder.

Dry Flowables or Granules (DF or WDG)

- A dry, granular pesticide similar to wettable-powders, however these are measured by volume rather than weight.



Soluble Powders (S or SP)

- A formulation in which the AI and all other ingredients completely dissolve in water to form a true solution.



Emulsifiable Concentrates (E or EC)

- A formulation consisting of a petroleum-based liquid and emulsifiers that enable it to be mixed with with water.

Flowables (F)

- Consist of finely ground particles of AI mixed with a liquid, along with emulsifiers, to form a concentrated emulsion.



Water-Soluble Solutions (S)

- Liquid formulations that dissolve in water to form a true solution.



Low-Concentrate Solutions (S)

- Are ready to use and require no dilution. Mostly household products.



Ultra-Low-Volume Concentrates (ULV)

- Very small amounts of liquid spray, applied over a unit of area. Usually less than $\frac{1}{2}$ gallon per acre.

Slurry (SL)

- A watery mixture containing pesticide powder, These leave a thick coating of pesticide residue on treated surfaces.



Fumigants

- Vapor or gas used to penetrate porous surfaces for control of soil-dwelling pests, or pests in enclosed areas or storage.



Invert Emulsions

- An emulsion where water droplets are suspended in an oil rather than the oil droplets being suspended in water.

Dusts (D)

- Are finely ground pesticide particles that are not mixed with water to apply.

Tracking Powders

- A fine powder that is dusted over a surface to detect or control certain pests such as cockroaches or rodents. For control, the inert powder is combined with a pesticide; the animal ingests this powder when it cleans itself and becomes poisoned.

Granules (G)

- A dry formulation of pesticide active ingredient and inert materials compressed into small, pebble-like shapes.

Pellets (P or PS)

- Consist of dry AI and inert materials pressed into uniform-sized granules.



Microencapsulated Materials

- Particles of the AI are encased in plastic capsules; pesticide is released after application when the capsules break down.



Water-Soluble Packets

- These reduce the risks in mixing and handling. The packages are preweighed amounts of wetttable powders in a special type of plastic bag, which dissolves and releases the chemical into the tank mix.



Baits

- A food or food-like substance that is used to attract and poison pest animals.



Attractants

- Attract certain species of animals to traps or baits.



Aerosol Containers

- Emit very fine liquid droplets or dust particles, because of the pressurized unit.

Impregnates

- An item, such as a flea collar, that has been manufactured with a certain pesticide in it. These will emit small localized quantities of pesticides over an extended period of time.

Repellents

- A pesticide used to keep target pests away from a treated area by saturating the area with an odor that is disagreeable to the pest.





Animal Systemics

- Systemic pesticides that protect animals against fleas and other external blood-feeding insects as well as against worms and other internal parasites.



Fertilizer Combinations

- A common practice where insecticides, herbicides, or fungicides are mixed with fertilizers.

Mixing Pesticides

- Add formulations in the following order:

- 1) Wettable Powders
- 2) Flowables
- 3) Water-Soluble Concentrates
- 4) Emulsifiable Concentrates

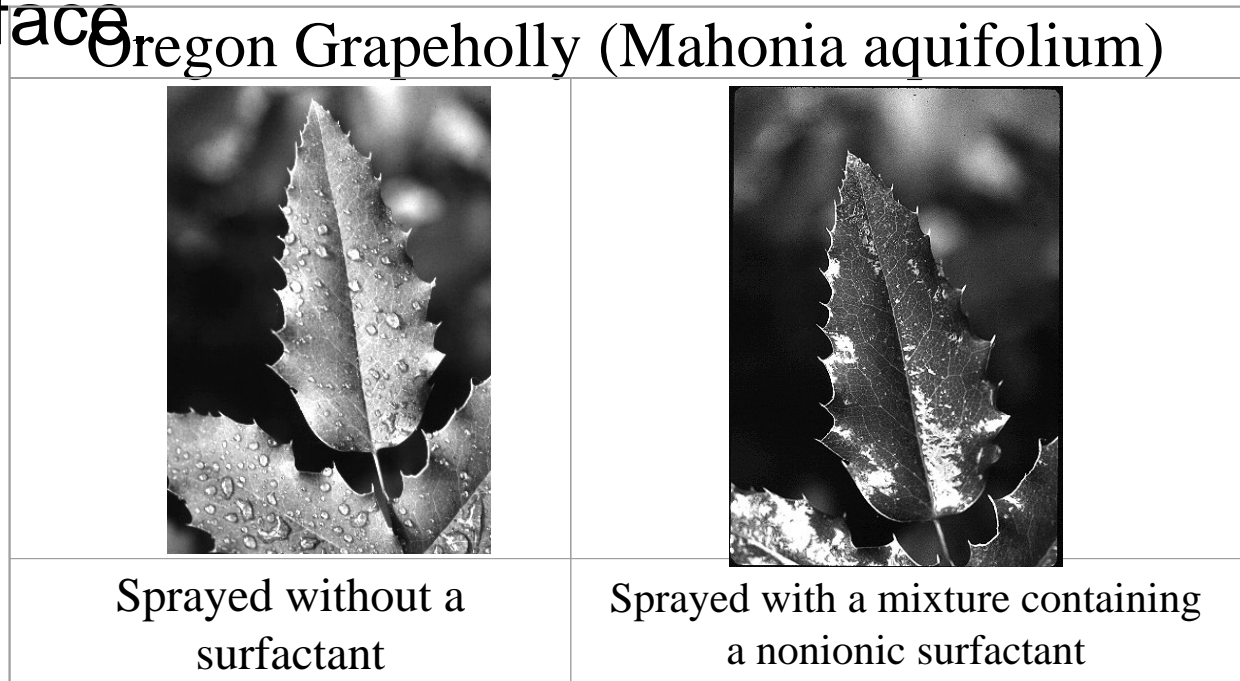
Doing this will assure proper mixing however you need to make sure the chemicals are compatible with one another.

Adjuvants

- Is a material added to a pesticide mixture to to improve or alter the deposition, toxic effects, mixing ability, persistence, or other qualities of the active ingredient.

Surfactants


- Used to improve the ability of the pesticide to stick to and be absorbed by the target surface





Stickers

- Used to prevent pesticides from being washed or abraded off treated surfaces.



Spreader-Stickers

- Lowers the surface tension of treated surfaces to enable the pesticide to be absorbed.



Extenders

- Enhance the effectiveness or life of a pesticide by some means such as screening ultra-violet light, slowing down volatilization, or improving sticking qualities.



Activators

- Increases the activity of a pesticide by reducing surface tension or speeding up penetration through insect or plant cuticle.



Compatibility Agents

- Improves the ability of two or more pesticides to combine.



Buffers

- Lowers the pH of a spray solution and, depending on its concentration, can maintain the pH within a narrow range.

Acidifiers

- Used to lower the pH (or acidify) the water being mixed with a pesticide. Pesticides break down more slowly if the water is slightly acidic. Sometimes called acidulators.



Deposition Aids

- Improves the ability of a pesticide spray to reach the target.



Defoaming Agents

- Eliminates foaming of a pesticide mixture in a spray tank.



Thickeners

- Increases the viscosity of the spray solution so that larger droplets are formed by the nozzle; thickeners are used to control drift.



Attractants

- Food or bait, such as sugar, molasses, protein hydrolysates, or insect pheremones, to attract a pest to the pesticide.



Spray Colorants

- Are dyes you add to the spray tank to be able to see areas already sprayed.
Excellent for herbicide sprays.