Application Equipment and Calibration

The proper selection of application equipment and its correct operation and maintenance are perhaps as important to effective pest control as the selection of the pesticide itself. The substantial investment in equipment requires that the choice be based on a thorough familiarity with all alternatives, including recent developments in application technology. Many problems of current concern, such as non-uniform coverage and failure of a pesticide to effectively reach the target organism, area at least partially solvable through proper selection and correct operation of application equipment.

When selecting a sprayer, be certain it will operate effectively when subjected to the deteriorating effects of some formulations on hoses, seals, tanks, etc. Other selection considerations should include durability, cost and convenience in filling, operating and cleaning. The function of any sprayer is to deliver the proper rate of chemical and apply it uniformly.

Termite Application Equipment

Termite control requires specialized equipment. The basic piece of equipment for termite control is that used to force chemicals into the soil, foundation voids and areas to be flooded.

In general, your equipment should have enough pump capacity to provide adequate in-line pressure for a hose reaching half way around the structures you normally treat. The longer the hose length used, the greater the drop in pressure. The pump should have adjustable pressure and a bypass valve. Either gasoline-powered engines or electric motors can be used.

Components of Sprayers

For proper maintenance and operation, a thorough knowledge of the various sprayer components is essential. The major components of a sprayer are the supply tank, pump, flow control and nozzles. Other important components include strainers, pressure gauges, hoses and fittings.

Tanks

Because sprayer tanks hold the spray mixture, they must be made of material that is resistant to corrosion from the various pesticide formulations that might be used. Suitable materials include stainless steel, polyethylene plastic and fiberglass. Some pesticides cause corrosion in aluminum, galvanized and steel tanks; therefore, these materials should be avoided.

The filler opening should be large enough to accommodate easy filling and inspection for cleanliness. The cover should form a watertight seal when closed. Some tanks have a screen just under the cover to remove dirt from water during filling. Larger tanks should have some support device to hold the water hose above the filler opening to prevent back siphoning. All tanks should have a shutoff valve located at their lowest point. Tank capacity markings must be accurate to facilitate adding the correct quantity of water or other carrier.

Polyethylene tanks are inexpensive, lightweight and resist corrosion. Although polyethylene tanks are tough and durable, the tank must be replaced if it becomes cracked or broken. And because ultraviolet light causes polyethylene to break down, these tanks should be kept out of the sun when not being used.

Fiberglass tanks are strong and durable but may break or crack when subjected to impact. These tanks are inexpensive and can be used with most chemicals but may be affected by some solvents.

Stainless steel is the highest quality material for pesticide applicator tanks. It is strong, durable and resistant to corrosion by any chemical.

Pumps

The heart of the spraying system is the pump. It must deliver the necessary flow to all nozzles at the desired pressure to ensure uniform distribution. Pump flow capacity should be 20 percent greater than the largest flow rate required by the nozzles and hydraulic agitation to compensate for pump wear.

Other considerations are resistance to corrosive damage from pesticides, initial pump cost, ease of priming and power source available. The materials in the pump housing and seals should be resistant to chemicals, including organic solvents.

Pesticide sprayers commonly use roller, centrifugal, piston, and diaphragm pumps. Each has unique characteristics making it well adapted for a particular situation. Roller, piston and diaphragm pumps are positive-displacement pumps; that is, the volume of output per revolution is always the same, regardless of speed or pressure. In contrast, the output per revolution of centrifugal pumps varies with speed and pressure.

Strainers

Proper filtering of the spray mixture protects the working parts of the spraying system. Three types of strainers commonly used on sprayers are tank-firer, line and nozzle. As the mixture moves through the system, strainer openings should be progressively smaller. Strainer mesh is described by the number of openings per linear inch; a high number indicates a small opening.

A 12- to 20-mesh strainer should be used in the tank filler opening and 40- to 50-mesh is suggested for the line strainer. For positive-displacement pumps (roller, piston and diaphragm), the line strainer should be located between the pump inlet and tank. For centrifugal pumps, it should be located immediately after the pump outlet. Dirt has a smaller impact on centrifugal wear as compared to other pumps.

Nozzle strainers are sometimes installed to ensure that nozzles do not clog. These strainers vary in size but common sizes are 50- and 100-mesh.

Hoses

Use synthetic rubber or plastic hoses that have a burst strength greater than peak operating pressures, resist oil and solvents present in pesticides and are weather-resistant.

Sprayer lines must be properly sized for the system. The suction line, often the cause of pressure problems, must be airtight, non-collapsible, as short as possible, and have an inside diameter as large as the pump intake. A collapsed suction hose can restrict flow and cause damage to pump seals.

A minimum of restrictions and fittings should exist between the pressure gauge and nozzle. The proper size line will vary with the size and capacity of the sprayer. A high, but not excessive, fluid velocity should be maintained throughout the system. If lines are too large, the velocity may be so low that the pesticide will settle out and clog the system.

Flow-Control Assembly

The flow-control system directs the flow of the spray mixture and assures that enough flow reaches the nozzles at the desired pressure. The major component is a pressure shutoff valve or a throttling valve.

A pressure gauge must be a part of every sprayer system to correctly indicate the pressure at the nozzle. Pressure directly affects the application rate and spray distribution. Annually check the pressure gauge with a gauge known to be accurate. The total range of a pressure gauge should be two times the maximum expected reading. When selecting a gauge, be sure the internal materials are resistant to the corrosiveness of the spray mixture.

Treating Tools

Various types of implements are used on the end of the hose; a quick-acting valve is highly desirable between the hose and such implements. Generally, three different types of treating tools are used, each tool can be fitted with one of several different tips:

1. Three- to 6-foot pipes are used to force chemicals down into the soil along foundations; these pipes are frequently referred to as rods or soil-rodding devices. Various tips are available for use on these rods.

2. Shorter pipes or rods are used to inject chemicals into wall voids.

3. A subslab injector is used to insert a rod through a concrete slab and inject chemicals into the soil beneath the slab. The injector seals the hole around the injector tube preventing the chemical from spewing out of the hole as a result of backpressure.

Foaming Agents

The use of foaming agents is a developing technology in termite control. The foam is a compact mass of air bubbles separated from each other by a liquid film; air makes up about 85-95 percent of the foam. There are wet and dry foams depending on how much water is used in the mix. After a few minutes to hours after application, the foam breaks down into a liquid as the bubbles collapse.

The foam helps distribute insecticide that is injected in areas that are difficult to treat, such as under slabs and outside steps, around rubble foundations, behind veneers and in voids found in walls, chimneys and masonry. Most of these sites are treated blindly. Foams will disperse around obstructions, rather than being deflected as liquids are, and will better fill a void. As the foam breaks down, it will leave a thin residue on all surfaces it had contacted. This will result in a more complete, uninterrupted treatment barrier.

Be sure the formulation does not contain anti-foaming agents that can complicate the treatment. Some pesticide manufacturers are using special termite formulations to mix better with foaming agents.

Calibration

Application rates may be determined by use of a flow meter (water meter), timer or “slow count” method. In a timer or slow count method, a one-gallon container is filled with water and the delivery rate is determined on a “timed” basis. When using either method, the rate should be periodically checked because delivery rates can change. The rate also should be checked when applying large quantities of solution to make sure that timing or count is accurate. Injecting chemicals into soil results in lower delivery rates per unit of time because of backpressure. Differences in soil composition and compacting also affect delivery rate. In most instances, a flow meter is preferred because it provides the operator a constant and accurate reading of delivery rate. Sample calibration problems are given below.

Sample Calibration Problems

1. Computing solutions as percentage of weight.

$$\text{lbs of pesticide to use} = \frac{\text{\% by wt. Desired x gal. Final product x 8.34}}{\text{\% of original product}}$$

EXAMPLE: How much wettable powder pesticide containing 40% active ingredient should be added to a 100-gallon tank if recommended treatment is 0.25% concentrate by weight?

$$\text{lbs of pesticide to use} = \frac{\text{0.0025 x 100 gallon x 8.34}}{\text{0.40}} = \text{5.2 lbs pesticide needed}$$

2. Computing ppm in solution from mixing wettable powder.

$$\text{lbs of pesticide to use} = \frac{\text{PPM Desired x gal. Final product x 8.34}}{\text{1,000,000 x \% of original product}}$$

EXAMPLE: How much wettable powder pesticide containing 40% active ingredient should be added to a 100-gallon tank if recommended treatment is 1200-ppm a.i.?

$$\text{lbs of pesticide to use} = \frac{\text{1200 x 100 gallon x 8.34}}{\text{1,000,000 x 0.40}} = \text{5.2 lbs pesticide needed}$$

3. Compute ppm mixing emulsifiable concentrate.

$$\text{Gallons of pesticide to use} = \frac{\text{PPM Desired x gal. Final product x 8.34}}{\text{1,000,000 x \% of original product}}$$

EXAMPLE: How much liquid emulsifiable concentrate containing 0.625 lbs active ingredient (a.i.)/gallon should be added to a 100-gallon tank if recommended treatment is 300 ppm a.i. of a liquid pesticide?

$$\text{Gallons of pesticide to use} = \frac{\text{300 x 100 gallon x 8.34}}{\text{1,000,000 x 0.625}} = \text{0.4 gallon pesticide needed}$$

4. Compute % of desired concentration when using an Emulsifiable Concentrate. (The gallons of EC needed to mix a spray containing a given percentage of a.i.)

$$\text{Gallons of pesticide to use} = \frac{\text{Gallons Desired x \% a.i. X 8.34}}{\text{Lbs a.i./gallon x 100}}$$

EXAMPLE: How much 25% EC (2 lbs/gal) pesticide is needed to make 50 gallons of a 0.25% finished spray?

$$\text{Gallons of pesticide to use} = \frac{50 \text{ x } 0.25 \text{ x } 8.34}{2 \text{ x } 100} = 0.52 \text{ lbs pesticide needed}$$

5. Compute percent concentration when ppm is known.

$$\text{\% Concentration} = \frac{\text{PPM}}{10{,}000}$$

EXAMPLE: What is the percentage of a solution with 1,000 ppm?

$$\text{\% Concentration} = \frac{1{,}000}{10{,}000} = 0.1\%$$

6. Compute ppm of a solution when the percentage is known.

PPM = % x 10,000

EXAMPLE: How many ppm of a pesticide is there in a 2% solution?

PPM = 2 x 10,000 = 20,000 ppm

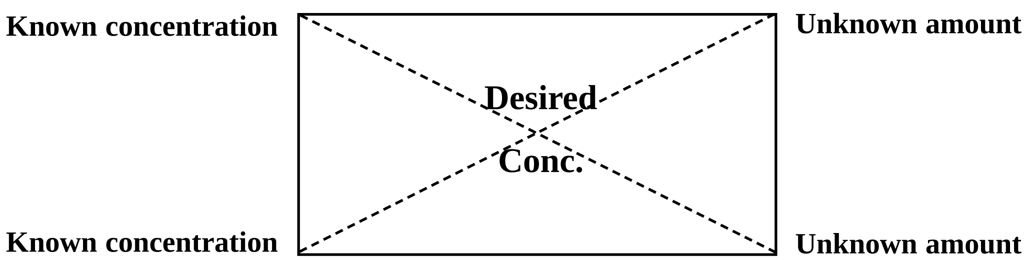
7. Compute dilution of a concentration of known percentage to the desired percentage.

$$\text{Amount of concentrated pesticide to use} = \frac{\text{Desired amount of final product x concentration of final product}}{\text{Concentration of original product}}$$

EXAMPLE: How much 40% dust pesticide is needed to mix 5 lbs of a 25% powder?

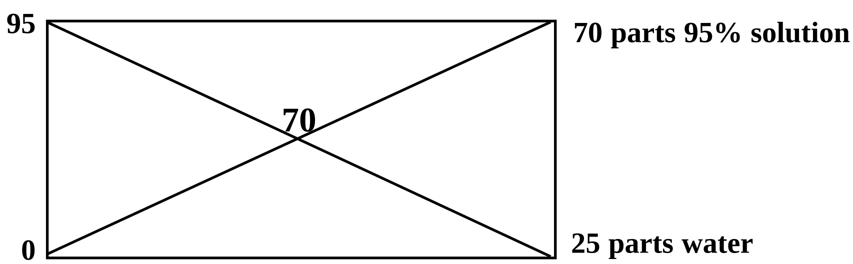
Amount of pesticide to use = $\frac{5 \times 25}{40}$ = 3.125 lbs pesticide and 1.875 lbs filler needed

8. Dilution to a desired concentration by using Dairyman's Rectangle.



(Subtract along dotted lines)

EXAMPLE: Make a 70% solution from a 95% solution.



9. Computing the area to be fogged or space treated. (Cube)

A. Area is a parallelogram.

Cube = length x width x height

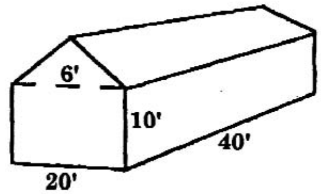
Example: 40 foot long   20 foot wide   10 foot high

Cube = 40 x 20 x 10 = 8,000 cubic feet

B. Area with a pitched ceiling.

Cube = length x width x wall height + $\frac{\text{Pitch height x width x length}}{2}$

Example: Length = 40 feet
Width = 20 feet
Wall height = 10 feet
Pitch height = 6 feet



$$\text{Cube} = 40 \times 20 \times 10 + \frac{6 \times 20 \times 40}{2} = 10{,}400 \text{ cubic feet}$$