



Chemical Weed Killers and Their Use

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General Precautions

Chemical weed killers are another tool for destroying weed plants and should not be expected to solve all weeding problems. Select the proper chemical and apply it at the right time and at the recommended concentration.

Measure the chemical and the area to be sprayed—do not guess. Weed killers have a very narrow range of concentration that can be used effectively. Applying too little chemical is a waste of time and money, applying too much will kill the crop.

Treat all weed killers with the respect due poisonous materials. Remove clothing from the body immediately if spots or areas become saturated with chemicals, particularly those containing oils or undiluted oils as used for weeding carrots.

In spraying fence rows or roadsides remember some spray will be carried by the wind and may damage the property of others.

Compounds of 2,4-D and 2,4,5-T have no place in the vegetable or flower garden and should be used with great care around ornamental plantings in the lawn. Hand sprayers and other containers used in connection with 2,4-D should not be used in applying other weed killers or insect sprays in the garden. Methods have been devised to remove 2,4-D from utensils but usually the job is not thorough enough to insure against injury to sensitive plants.

Weed killers and insect sprays generally should not be mixed and applied together.

University of Alaska

**ALASKA AGRICULTURAL EXPERIMENT
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CHEMICAL WEED KILLERS SAVE LABOR AND BOOST PROFITS - - -

HERE ARE SOME FACTS YOU SHOULD KNOW ABOUT WEED KILLERS

Weed control studies at the Matanuska Experiment Station during the past two seasons have shown that many garden and field crops can be weeded satisfactorily with chemicals. Killing weeds with chemicals promises many benefits to the Alaskan farmer and gardener. Chemical weed killing is cheap and effective—more important this practice helps reduce the seasonal peak labor loads encountered in truck growing enterprises. This circular tells what the Alaska farmer and gardener can expect weed killers to do for him under Alaskan conditions.

Since garden seeds and weed seeds germinate at about the same time, chemicals used for controlling weeds must either be selective in their action or be applied at a time when the least damage will be done to crop plants. Chickweed, lambsquarter and mustard—our most troublesome weeds—can be killed easiest in the seedling stage and with a minimum of chemical.

What are weed killers?—There are three general kinds of chemical weed killers, technically called herbicides:

- (1) Contact killers (such as oil) destroy most vegetation with which they come in contact.
- (2) Growth regulators (such as 2,4-D, maleic hydrazide and Crag 1) act slowly through the leaves and roots and disorganize a plant's growing processes.
- (3) Systemic poisons (such as sodium trichloroacetate and IPC enter the plants mainly through the roots and prevent further cell growth.

Plants differ in their tolerance to injury by weed killers. Each kind of plant presents a special problem and must be treated with a special chemical.

Weed killer names—Some people are confused by the names of weed killers. Most growth regulators and systemic poisons are complex chemicals. Some of them, like "sodium trichloroacetate" (TCA) and "maleic hydrazide" (MH), do not have a common name although they may be manufactured and sold at some future time under a trade name. Most of them have names so long that abbreviations are commonly used as, for example, 2,4-D, 2,4,5-T, IPC and MCP. Trade names of a few other common weed killers are Premerge, Aero Cyanate, Dow General, Sinox PE, Crag 1 and Stoddard Solvent.

Ask for what you want—Some of the materials discussed below are not now available at retail stores in Alaska but will be stocked when a demand has been built up. Ask your dealer for them—if he does not have them they can be purchased from the manufacturers, some of whom are mentioned in the following discussion. Mention of specific trade names in this circular is not necessarily a recommendation of that specific

brand—trade names are used only as a matter of convenience.

Pre-emergence treatments—When any of these chemicals are applied before the crop emerges they are called "pre-emergence treatments" in contrast with applications after emergence or "post-emergence treatments." Pre-emergence applications generally require more chemical than post-emergence treatments. On the other hand only small volumes of water, ranging from 15 to 40 gallons per acre, are needed for pre-emergence treatments.

Instructions on weed killer packages are often in terms of pounds or quarts per acre. The home gardener will find it useful to remember that:

An acre is 43,560 square feet (or a plot about 209 feet square)

Two to 3 gallons of water will wet 1,000 square feet of garden.

A pint of water weighs about 1 pound.

A pint equals 2 cups, 16 ounces, 32 tablespoons, or 96 teaspoons.

A teaspoon equals 5cc; a pint, 473cc; a quart, 946cc.

How to apply—Most weed killers are made so they can be very simply applied in a water spray. A few are insoluble but these can be mixed with water by adding a small amount of oil and emulsifier (artificial soaps like "Tide" or "Dreft" are good emulsifiers). Very few weed killers are applied as a dust because of the difficulties of spreading. A light breeze may blow the dust and injure plants other than weeds. Similar disasters may occur when high pressures of 100 pounds per square inch or more are used. High spray pressures break up the solution into fine particles that will drift like a fog. Remember your neighbor's crops. Avoid dusts and high pressure sprays that may involve you in damage claims.

Use a knapsack sprayer for your garden—Because low pressures are best, inexpensive equipment can be used for applying weed killers. For the home gardener, a 3- to 5-gallon knapsack sprayer with a flat-fan spray nozzle is desirable. A flat-fan spray pattern (in contrast to the conventional circular pattern) permits selective spraying around small plants and spraying narrow bands along a row. Nozzles with an 80 degree fan angle and openings of 0.02 to 0.06 inches in diameter will spray at the rate of 20 to 70 gallons per acre depending on how fast a person walks. For high rates larger nozzle openings are necessary. A single spraying at the desired rate is better than using a smaller nozzle which may require going over the same area twice.

MAKE A TRACTOR SPRAYER FOR WEEDING LARGE FIELDS

A fairly inexpensive tractor-mounted sprayer can be assembled at home. A tractor sprayer properly used will pay for itself in a single season. **For complete ground coverage** you want a "boom sprayer" mounted at the rear of the tractor so that soil turned up by the rear tires can be completely covered by the spray. The essential parts of a tractor-mounted sprayer are:

1. Gear pump with a $\frac{3}{4}$ -inch or 1-inch inlet and outlet that will pump 270 gallons of water per hour at 40 pounds pressure when driven at 300 to 400 RPM (power take-off speed when the tractor is moving at 3 to 4 miles per hour). Smaller pumps driven by V-belts and differential pulleys can be operated at higher speeds to deliver necessary volumes but power loss through belt slippage frequently causes variable rates of spray delivery at the nozzles. Bronze gear pumps costing \$15 to \$30 are stocked by some stores in Alaska or they may be obtained from mail order houses.
2. A sleeve coupling to attach the pump to the power take-off shaft. Note that power take-off shafts may be $\frac{7}{8}$ -inch, 1 $\frac{1}{8}$ -inch or 1 $\frac{3}{8}$ -inch in diameter (depending on make of tractor) and the pump shaft may be of $\frac{1}{2}$ -inch or $\frac{5}{8}$ -inch diameter.
3. A pressure regulator to adjust spray pressure from 20 to 40 pounds per square inch. This may already be built into the pump. If not, it can be bought for \$4 to \$5 and placed in the pressure lines between the pump and spray boom. Pumps with built-in regulators are not as versatile as an assembly that has a separate regulator and pump.
4. A pressure gauge (range 0 to 100 pound pressure per square inch) mounted in the pressure line on or near the spray boom.
5. Thirty feet of garden hose and at least four $\frac{3}{4}$ -inch connectors (Hose to be cut to proper lengths.)
6. Four brass hose adapters ($\frac{3}{4}$ -inch pipe thread x $\frac{3}{4}$ -inch hose thread).
7. A rapid shut-off valve in the pressure line.
8. A suction strainer, preferably with built-in foot valve.
9. Spray nozzle bodies with flat-fan tips, 50 mesh strainers and check valves. Strainers with check valves that close at low pressures (5 to 8 pounds) are necessary to prevent dripping from the nozzle when sprayer is turned off. Nozzle bodies with $\frac{1}{4}$ -inch male pipe threads are most serviceable. Nozzle tips that throw a fan spray of 80 degrees are mounted 20 inches apart on the boom. For uniform pressure at all nozzles the pressure line should enter the boom near its center.
10. A spray boom made in 3 sections and hinged so that the end sections raise to permit road travel or side delivery from one section for spraying brush and fence rows. The boom may be made of $1\frac{3}{4}$ -inch galvanized iron pipe tapped and threaded for $\frac{1}{4}$ -inch nozzles. Half-inch copper tubing with sweat fittings may also be used. The latter is simple to construct, practically free of corrosion that will clog the nozzles, and light even when full of solution. Copper fittings may be difficult to get, especially the sweat-to-female thread bushings adapting the half-inch copper tees to $\frac{1}{4}$ -inch male nozzles.
11. An improvised platform supported by the draw bar carriage for carrying the 15- or 55-gallon spray tank and for mounting the spray boom.

See Bulletin B 328, Oklahoma Agricultural Experiment Station, Stillwater, Oklahoma or Bulletin 741, New York Agricultural Experiment Station, Geneva, New York, for description and use of a tractor-mounted sprayer. Working models of sprayers and spray shoes may be inspected at the Matanuska or Fairbanks Agricultural Experiment Farms.

For spraying row crops a pair of hooded spray shoes is often better than a boom sprayer. These spray shoes are conveniently mounted on the tractor row-cultivator frame in place of the forward cultivator teeth. They serve to focus the spray on the row and are especially valuable in applying maggot control sprays at the base of cabbage and cauliflower plants. For a 2-row outfit a pair of hoods, spray nozzles and hose lines are needed on each side of the tractor.

**HERE ARE SOME WAYS WEED KILLERS HAVE BEEN USED IN ALASKA
TRY THEM - - - THEY HAVE A DEFINITE PLACE IN YOUR FARM OPERATIONS**

Weed your potatoes with spray—Good control of chickweed, lambsquarter (pig weed) and mustard is obtained by spraying the entire field just before the potatoes break ground or when not more than ten percent of the hills are showing. Eight to 10 quarts of Premerge mixed in 15 to 20 gallons of water and applied to one acre at 40 pounds pressure gives good control. Quackgrass, volunteer grains and potato sprouts are burned severely but recover rapidly. Three to 4 pints of Dow General Weed Killer per acre in 15 to 20 gallons of water kills sprouted seeds, but seeds that are not germinated at spraying time will grow later. In contrast, the residual toxicity of Premerge keeps weeds in check until hilling time.

Cultivation for weed control is unnecessary where either of these sprays is applied. In fact, cultivation brings to the surface another crop of weed seed to germinate before the potatoes are hilled. Some growers like to cultivate between potato rows for reasons other than weed control; under such conditions complete coverage of the soil is unnecessary and some savings are obtained by spraying only in the rows to eliminate hand hoeing.

Use Stoddard solvent on carrots, celery, and parsnips—In their early true leaf stage of growth, carrots and parsnips resist injury by cleaning fluids, technically known as oils. Celery can also be sprayed up to transplanting time but is severely injured by later spraying. Stoddard solvent, a typical weed killing oil, is highly inflammable and must be used and stored with the same caution as in handling gasoline. A complete cover spray of 100 to 130 gallons per acre of undiluted oil gives good control of most weeds except yarrow. Row coverage in conjunction with cultivation between rows requires less spray material and is a good practice where a grower wants to cultivate for reasons other than to control weeds.

Peas can be weeded with chemical sprays—Peas are easily weeded with Dow Selective Weed Killer and Sinox-W. Aero Cyanate also kills small weeds. Uniform and complete coverage of weeds when they are in the early seedling stage (when peas are between 2 and 6 inches tall) is the most economical procedure. Some foliage burn appears if a good job of weeding is done but young peas soon outgrow this apparent injury.

Quackgrass control—Much progress has been made in controlling quackgrass without sacrificing the use of the land during the season of treatment. Twenty-five to 50 pounds of sodium trichloroacetate (TCA) dissolved in 100 gallons of water is sufficient for one acre. It is best used in conjunction with cultivation which exposes the quackgrass roots to direct contact with the chemical. Quackgrass is either killed or its vigor is reduced by this treatment so that cabbage, cauliflower and potatoes can be grown successfully.

Onions can be chemically weeded—Onions are satisfactorily weeded with sprays containing 12 to 15 pounds of Aero Cyanate per acre, dissolved in 100 gallons of water. For small gardens dissolve 1 ounce of crystalline Aero Cyanate in 3 pints of water; this is sufficient solution to cover a 100-foot row 6 inches wide. The spray seems to give the best control of chickweed with a minimum of injury to the onions where applied when the crop is growing slowly and when the weeds are very small. When applied with a hand sprayer, the nozzle can be directed at the row in a manner to avoid heavily spraying the onion tops.

Use salt on beets—Seedling beets with three true leaves are resistant to injury by a complete cover spray of common salt. Younger beets are, however, damaged severely by salt sprays. Two pounds of salt in a gallon of water applied at the rate of 1 pint of solution per 50 linear feet of row (6 inches wide) gives good control of chickweed, mustard, wild buckwheat and yarrow. For an acre, this treatment requires 400 pounds of salt dissolved in 200 gallons of water. Lambsquarter has about the same tolerance to salt as beets and is therefore not damaged by the spray.

Control fence row and roadside weeds—Brush and broad-leaved weeds in fence and stump rows are controlled by spraying with a mixture of 2, 4-D and 2,4,5-T. Two pounds of each chemical mixed with 50 gallons of water and applied in sufficient volume to wet thoroughly all foliage will kill small brush. From 100 to 200 gallons of mixture per acre are needed, depending on the size of the brush. Spraying when the foliage is lush and nearly fully developed seems to be most effective. Manufacturers of these chemicals also give directions for their use on dormant brush during the winter.

Chemicals will weed your lawn—Weeds in newly seeded lawns are easily killed by Dow Selective Weed Killer, Sinox-W, or Aero Cyanate, providing the spray is applied while the weeds are less than 2 inches tall. In old lawns perennial weeds are killed by the amine forms of 2,4-D—the ester forms are volatile and should be avoided. Two pounds of active ingredient per acre gives good control of dandelion and plantain. Read the label on the container to find out how much active ingredient is contained in your 2,4-D. If the label shows that one quart contains 50 percent or one pound of active ingredient, mix four teaspoonsful of the liquid with one gallon of water for each 1600 square feet of lawn. If the label shows the concentration to be 25 percent active ingredient, 4 teaspoons are needed in 1 gallon of water. Other concentrations can be diluted accordingly.

