Selective Weed Killers

character of crop plants and weeds must be known to determine proper chemical control methods

A. S. Crafts and W. A. Harvey

Differential wetting is an important factor in the successful use of selective weed killers—chemical herbicides.

Broad-leaved weeds—such as mustard, radish or fiddleneck—are more easily wet by water sprays, and retain small droplets on leaf surfaces. Some plants—such as cereals—have waxy leaf surfaces, corrugated, or formed of very small ridges. Water sprays bounce off such leaves in droplets or wet the surface only in small spots.

The horizontal angle of leaves growing from the stems of weeds—in contrast to narrow, upright leaves of cereals—also helps to retain the spray.

When the seedlings of certain weeds, such as knotweed—*Polygonum aviculare*—attain true leaves, they are as difficult to wet as are crop plants. It has been found impossible to kill such weeds in peas, flax, young alfalfa, and other broad-leaved crops where selectivity depends upon differential wetting alone. In such cases, the weed can be controlled only by spraying while it is in the cotyledon—two-leaf—stage.

All plants are more susceptible to herbicides when in the small seedling stage than when growth is farther advanced. They are also more susceptible during warm, moist weather than they are when it is cold and dry.

To kill plants, the spray must wet the growing points. In cereals these are located in the crown, below the soil surface, and are protected by surrounding leaves. Broad-leaved weeds with exposed growing points at the tips of the shoots and in the leaf axils are easily killed by toxic sprays.

Differences in plant tolerance to toxic chemicals—biochemical selectivity—will determine the best type of weed killer. Some plants tolerate the toxic action of certain chemicals better than do others. For example—2,4-D applied in a nontoxic oil or as a dust will kill weeds such as mustards, radish or fiddleneck in cereals, and leave the cereals unharmed. Biochemical selectivity operates in the root systems as well as on the foliage of plants.

Of the various weed killers, the greatest use of the dinitro selectives—one of the most important herbicides—has been to kill wild mustard, radish, fiddleneck, and other broad-leaved weeds in wheat, barley, and oats. The two main compounds are sodium dinitro-ortho-cresylate and the ammonium salt of dinitro-ortho-secondary-butyl-phenol.

One weakness of the dinitro sprays is that they will not kill weedy grasses. A new use for the dinitros is the control of weeds in cover crops—particularly weeds in purple vetch on vegetable land. This has lowered weeding costs considerably.

Potassium cyanate is the new selective herbicide for onion crops—more selective and much less corrosive than sulfuric acid.

Certain refined oils have been developed as selective sprays on carrots and related crops because stove oil sprays—formerly in common use—left an unpleasant flavor and reduced the market value of the crops. The new sprays have a greater selectivity and higher toxicity than stove oil.

First used for rice and small grains, 2,4-D is effective on broad-leaved annual weeds, such as mustard, radish, and fiddleneck in small grains, and water plantain and arrowhead lily in rice. It is also used on morning-glory and star thistle in barley, morning-glory, kelp, pigweed, and jimson weed in milo, and on many broad-leaved weeds, including the above, in corn. In addition, weeds in strawberries and flax are being controlled by 2,4-D, as are many brushy species of weeds on range land.

Most of the applications of 2,4-D have been made as sprays—with dusts used only to a limited extent.

Three chemicals have proved effective as herbicides where grassy weeds are involved.

I.P.C.—isopropyl-N-phenyl carbamate—is being used to control winter annuals and bunch grasses in ladino clover and alfalfa pastures. Absorbed from the soil, it kills grasses at concentrations that do not seriously injure the pasture crops.

Both the sodium and ammonium salts of T.C.A.—trichloroacetic acid—are being used to control perennial grasses. These materials are effective either as sprays or soil treatments.

Phenyl mercuric acetate—and other phenyl mercuric compounds—are effective in the control of crabgrass in lawns. They are poisonous to humans and animals and should be handled with the greatest caution.

A. S. Crafts is Professor of Botany and Botanist in the Experiment Station, Davis.

W. A. Harvey was Associate in Botany and in the Experiment Station, Davis (Resigned).

The above article is based upon the California Agricultural Extension Service Circular 157, Selective Weed Killers, *by the same authors and is available without cost from the local Farm Advisor or by addressing a request to the Agricultural Information Office, University of California.*