

# Weeds -- Growing Pains of Progress

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Weeds! The ubiquitous and vigorous plants that are forever in the way of man's progress. Thing for a moment with me about a weedy situation.

The asphalt roadway ahead rises up, cracks, explodes and pops open in many places as torpedograss (*Panicum repens*, L.) runners, bermuda grass (*Cynodon dactylon*, (L.) Pers.) stems, and nutgrass (*Cyperus rotundus*, L.) shoots thrust their way through to the sunlight. Fences say, breaking and falling under the imponderable weight of entwining vines. An entire train, from diesel engine to the caboose, stands unattended in a sea of grass that covers the wheels and tracks—all because a trainman thought he saw a snake. Culverts gone, bridges out, dikes broken—the pressure of millions of gallons of water on rafts of floating weeds finally broke through these structures in an awesome demonstration of the power of water out of control. A grim picture? Yes, and yet, some of it happens every day.

Until just recently, businessmen accepted weeds as an inevitable problem—Spring flowers brought wild flowers and and vigorous weeds that threatened to take over the land. It is interesting to note that in a society that has learned to control almost everything, that we have done so little to control weeds.

Weed control of some type is required annually in the United States, on some 30 million acres used by railroads and highways, 60 million acres of industrial property, and 33 million acres of single family homes (2). The losses from weeds and the cost of controlling them on agricultural lands alone are estimated to be about 3.8 billion dollars each year (4).

Weeds can be classified into two general groups—broadleaf and grassy. Then, in these groups there are annual weeds, biennial weeds and perennial weeds. Our most common weed plants are annual broadleaf weeds and annual narrow bladed grasses.

Since there is now a very wide range of herbicides available, it is important to select the most appropriate weed control chemical, correlated with the identification of the weed problem, and applied in the most effective manner. Time does not permit us to adequately discuss application equipment; however, acceptable commercial weed and brush control is possible only when the herbicide is applied with effective equipment.

The science of weed control has advanced more rapidly in the last 25 years than in the previous 100 centuries. Nearly all of this accomplishment was made with the products of organic chemistry. Weed killing chemicals are called herbicides and are divided into 3 main groups, depending on their effects on the plants: (1) Contact; (2) Systemic; and (3) Soil sterilant.

The contact herbicides kill plant parts covered with the chemical. In this group, the chemical is toxic to the living cells. There is little or no translocation through the living cells making up the phloem, but instead, these chemicals move upwards in the transpiration stream through the non-

living cells of the xylem. Generally, the effects are immediate and the plant dies quickly following the application. Contact herbicides are effective against annual weeds, but they provide only limited control of the above ground parts of biennial and perennial weeds.

There are two types of contact herbicides. These are the selective and the non-selective weed control agents. A selective herbicide may kill or stunt some plants with little or no injury to others. For example, DNBP is directly toxic to most mustards, checkweed, and henbit. It controls these weeds without injury to small grains.

A non-selective herbicide is toxic to all plants. In this instance, oil fortified with DNBP will kill all kinds of living plant tissue (3). Railroads and petroleum tank farms have made good use of this weed control system in their vegetation control programs. Of the newer contact herbicides, paraquat (bis (methylsulfate) (1,1'-dimethyl 4, 4'-bipyridinium bis (methylsulfate) is perhaps the most exciting. It is a highly versatile material that provides top kill and yet permits the roots to remain intact and alive to hold the soil in place. Paraquat kills annual weeds and burns down perennial weeds by a contact action that interferes with the photosynthesis process through desiccation of the cells.

The systemic herbicides are absorbed by either the roots or the foliage or stems and then translocated throughout the plant's system. These chemicals alter the plant's enzyme systems and the resulting changes upset the growth and metabolic processes. Systemic herbicides include 2,4-D, MCPA, 2,4,5-T and 2,4,5-TP.

Along highways, railroads, roadsides, ditchbanks, fence rows, and on other uncultivated areas, the soil sterilant chemicals will provide the most effective means of controlling the perennial grasses and broadleaf weeds. The term *soil sterilant* is really a misnomer since it is not completely justified. However, the treatment does result in the removal of the undesirable vegetation for extended periods of time as well as the weed seeds contained in the treated soil. The substituted ureas, represented by DuPont's "Karmex" diuron Weed Killer (3-(3,4-dichlorophenyl)-1; 1-dimethylurea), the symmetrical triazines, illustrated by Geigy's "Simazine" simazine herbicide (2-chloro-4,6-bis (ethylamino)-s-triazine), and the substituted uracils, such as DuPont's "Hyvar" Bromacil Weed Killer (5-bromo-3-sec-butyl-6-methyluracil), all give outstanding vegetation control. The soil sterilant herbicides prevent the growth of plants while their active ingredients are present in the soil. There are two main types of soil sterilants. They are: (1) Temporary—these materials sterilize the soil for four months or less; (2) Semi-Permanent—compounds falling in this category sterilize the soil for from four months to two years. The mode of action is through the roots and out through the growing points. In brief, the soil sterilants inhibit the process of photosynthesis and the plant dies.

For woody brush control on transmission right-of-ways,

in areas where volatility is not a hazard, either 2,4,5-T Amine, 2,4,5-T plus 2,4-D Amine, or 2,4,5-TP (Silvex) can be used successfully. For longer control and where volatility is a hazard, DuPont's "Ammate" AMS (ammonium sulfamate) in an oil-water emulsion has been used with a high level of success. "Ammate X" is non-volatile, non-flammable, and provides root kill as well as top kill. "Ammate X" has been found to kill more kinds of brush on power and telephone rights-of-way than any other brush killer available.

Dow's "Tordon" Picloram (4-amino-3,5,6-trichloropicolinic acid) is highly effective for the control of otherwise difficult perennial weeds and woody plants. These include bracken fern, and field horsetail. The woody plants include several species of maple, white poplar, black locust, sassafras, willows, cherries, persimmon and mesquite. "Tordon" is a volatile material and should be used with care in areas where this characteristic would constitute a hazard.

Industrial and governmental water management facilities containing fresh, salt-free water frequently contain aquatic weeds that must be controlled. Submersed aquatic weeds interfere with water movement: they also contribute to the collection of silt, and to the blocking of feeder canals and ditches. Balcom made a survey in the late 1940's which indicated that in the western United States the water loss in irrigation ditches alone amount to a loss of \$25,250,000 annually (1).

In many of the concrete-lined water supply ditches, Shell's "Aqualin" Herbicide, perhaps better known as Acrolein (acrylaldehyde (2-propenal), has been found to be beneficial for the control of submersed aquatic weeds, especially in a flowing water situation. Here in Florida, as elsewhere, much of our industrial water holding areas are covered with water hyacinth (*Eichhornia crassipes* (Mart) Solms.), duckweed (*Lemna minor*, L.) and water lettuce (*Pistia stratiotes*, L.). Not only do these plants obstruct the flow of the water, plug pump intakes; but also provide breeding places for mosquitoes and other insects as well as decreasing the desirable aquatic life in the water. The amine salts or the low volatile esters of 2,4-D at 2 to 4 pounds acid equivalent per acre, have long been used for control. Other herbicides that have provided effective con-

trol are ORTHO Diquat (6,7-dihydrodipyridine (1,2-a: 2',1'-c) pyrabidiinium salt) at 2-3 quarts product per acre and "Amitrol-T" amitrole (3-amino-1, 2,4-triazole) at a similar level. Both of the latter two chemicals are non-volatile; however, diquat will provide a faster sink-out, because of its desiccation action. Diquat is also specific for the control of water lettuce.

To be effective, the herbicides must enter the plant. Some plant surfaces absorb the weed control chemicals quickly; others do not. The addition of a non-ionic surfactant, such as Colloidal Product's X-77 (alkylarylpolyoxyethylene glycols), usually enhances the activity of the herbicide. For instance, the amount of amino triazole absorbed 24 hours after application was 13.3 percent without a surfactant and 77.8 percent with a surfactant. Quite naturally, with this type of increased performance, a great deal of surfactant is being used.

The national manufacturers of the herbicides are making all out efforts to provide complete information concerning their product's use. Before using any weed control chemical, it is recommended that the label be read and understood by all parties. The manufacturers have gone to considerable expense to place the use information on the label. Will you do your part and read the label before making the application?

The single most important factor in the successful use of industrial herbicides is the man on the end of the spray gun. He should have a working knowledge of the chemicals, an understanding of the weed problems at hand, and the ability to apply sufficient material at an economical rate to provide control.

#### LITERATURE CITED

1. Balcom, R. B. 1949. *Control of Weeds on Irrigation Systems*, U. S. Government Printing Office, Washington, D. C. 140 pp.
2. King, Lawrence J. 1966. *Weeds of the World*, Interscience Publishers, Inc., New York. p 349.
3. Klingman, G. C. 1961. *Weed Control: As A Science*, John Wiley & Sons, Inc., New York. pp. 21-22.
4. Souders, J. M., Danielson, L. L., Ennis, W. B., Jr., Klingman, D. L., Shaw, W. C., Timmons F. L. and Strickler P. E. 1962. *A Survey of Extent and Cost of Weed Control and Specific Weed Problems*, USDA Res. Serv. No. 34-23, 66 pp.