

though the rates of the liquids were relatively high in comparison with the dry formulations, they were easily and effectively applied with the spot-gun applicator. The results for the first test are given below [the control rating is based on a subjective, visual estimate of crown injury (0 = no control, 10 = complete crown death); ratings with the same letter are not significantly different at the 5 percent level of the Duncan's multiple range test].

Treatment	Rate [lb(ai)/A]	Avg Control Rating
Amdon 10-K	4	10.0
Banvel 5G	8	5.3
Banvel 5G	10	6.3
Banvel 5G	15	6.0
Banvel XP	8	5.6
Banvel XP	10	5.6
DPX-3674-A	10	8.7
DPX-3674-A-1	10	8.7
DPX-3674-A-1	20	9.3
Spike 20 P	2	6.7
Spike 20 P	3	7.7
Spike 20 P	6	8.0
Spike 80W	3	7.0
Control	--	0.0

PERFORMANCE-BASED CONTRACT SPRAYING

Donald Dalton

Dalton's presentation indicated that a performance specification with a written guarantee for herbicide spraying could be a valuable tool for the maintenance engineer.

NEW DEVELOPMENTS FROM DUPONT

Turney Hernandez

Herbicides are maintenance tools and we must learn to use these tools to maximize return on our maintenance investment, keeping in mind the many factors that affect performance. The key to success in vegetation management is the proper use of these herbicides in programs designed and planned over the long term.

The E.I. DuPont Company has roadside and industrial weed control specialists in most states in the United States. They work as a team in the roadside market. The company's objective is to supplement the efforts of roadside vegetation management specialists in every state with plot work, equipment adaptation or modification; helping with surveys, and assisting in developing efficient and effective use programs. We want to help you, the roadside vegetation management supervisor, accomplish the best job at the lowest cost. To do this, we position DuPont products along with those of other manufacturers in programs to accomplish this objective. These programs must be safe and satisfy the needs of your state. Some new developments from DuPont are

1. The development of a new 2-lb/gal water soluble formulation of Velpar;
2. The introduction of a 10 percent pelleted formulation of Velpar called the Gridball, which contains 0.335 g active ingredient per pellet for brush control; and
3. The introduction of krenite S, a new formulation containing a suitable surfactant.

DuPont is also developing three promising new

herbicides. A broadleaf weed killer that will control most of the problem annuals at rates of 0.25-1.25 oz/acre, a compound that is selective for control of Johnsongrass at rates between 0.25 and 1 lb/acre, and a foliage absorbed brush control that appears to be broad spectrum.

DOW HERBICIDES THAT WILL BE AVAILABLE IN THE FUTURE FOR ROADSIDE WEED CONTROL

Robert D. Fears

For many years, the Dow Chemical Company has sold herbicides for roadside weed control and will continue to develop herbicides for this use. These herbicides will have the ability to be used without adverse effects on applicators, wildlife, fish, or the environment. They will exhibit unique biological activity that will give advantages in weed control not offered by competitive products.

Due to continued cost escalation of raw materials, energy, and labor, new herbicides will sell at higher prices. As with present herbicides, the new products will also control a wider spectrum of woody plant species when mixed with other chemicals such as 2,4-D or Tordon.

One of the new products that Dow now has available for roadside weed control is Garlon. Garlon is the trade name for triclopyr or 3,5,6-trichloro-2-pyridinyl-oxyacetic acid. Through field tests and commercial applications, it has been demonstrated that Garlon herbicides are highly effective for the control of many woody plants and some broadleaf weeds. Herbicidal action of Garlon or triclopyr is through characteristic auxin-type response.

Formulations of triclopyr include Garlon 3A herbicide, which is a water-soluble triethylamine salt containing 3 lb of triclopyr/gal and Garlon 4 herbicide, which is an oil-soluble, water-emulsifiable butoxyethyl ester containing 4 lb of triclopyr acid equivalent/gal. Garlon herbicides are low in acute oral toxicity to mammals. Undiluted Garlon 3A is moderately to severely irritating and injurious to eyes and may cause slight to moderate skin irritation. However, when diluted with water for ground application, it becomes essentially nonirritating to the skin and may cause only slight discomfort and effects to the eyes. Undiluted Garlon 4 is essentially nonirritating to eyes and may be slightly irritating to the skin. Neither formulation is absorbed through the skin in acutely toxic amounts. Although Garlon 4 is toxic to fish, Garlon 3A is very low in toxicity to fish. Both formulations have very low toxicity to mallard duck and Japanese quail. Under temperature and moisture conditions favorable for microbial activity, triclopyr degrades quite rapidly in soil.

Lontrel, the trade name for DOWCO 290 or 3,6-dichloropicolinic acid, is the second new herbicide that Dow is developing. It has exhibited excellent herbicidal activity against members of the Polygonaceae, Compositae, and Leguminosae plant families. Like Garlon, DOWCO 290 induces characteristic auxin-type responses in growing plants. Lontrel 205, which contains 2 lb of 2,4-D acid equivalent and 0.5 lb of DOWCO 290 acid equivalent per gallon as the alkanolamine salts and M-3972, which contains 3 lb of DOWCO 290 acid equivalent per gallon as the monoethanolamine salt, are formulations being tested for weed control in turf and on roadsides.

DOWCO 290 and its formulations have low acute oral toxicity to mammals and are not absorbed through the skin in acutely toxic amounts. DOWCO

290 as the 3,6-dichloropicolinic acid is very slightly irritating to the skin on repeated or prolonged contact. It may be injurious to eyes, and some impairment of vision may occur if not flushed from the eyes promptly. These effects on skin and eyes are reduced by formulating DOWCO 290 into Lontrel 205 or M-3972. DOWCO has very low toxicity to fish, bobwhite quail, and mallard ducks. Garlon and DOWCO will effectively supplement the biological activity of Dow's existing herbicides such as 2,4-D and Tordon.

DEVELOPMENTS IN THE ELI-LILLY COMPANY A.T. Perkins

Perkins presented the new developments that are occurring in the Eli-Lilly Company. However, he requested that no information be published at this time in accordance with company policy.

FUTURE IN CHEMICAL ROADSIDE VEGETATION MANAGEMENT Roy R. Johnson

Union Carbide Agricultural Products Company has developed and is marketing many herbicides for the management of grasses, broadleaf weeds, and brush that grow on highway rights-of-way. Along with these herbicides and plant growth regulators, Union Carbide has developed application equipment to apply herbicides uniformly and with a minimum of drift. The Directa-Spra is widely used by municipal, county, and state highway departments. Where aerial application is feasible, the Microfoil boom provides accurate application with little drift potential. Two new devices, the Spirometer and the Mini-Wobbler, are currently being commercially developed. These devices can apply herbicides and plant growth regulators to highway vegetation in a swath of up to 50 ft from the spray vehicle without using a boom and at forward speeds of 10-15 mph. Typical spray volumes are 25-50 gal/acre. These application devices were used to treat several thousand acres in 1980. Use on typical highway sites will be investigated in 1981.

FLEXIBILITY IN ROADSIDE VEGETATION MANAGEMENT PROGRAM C.W. Middleton

Major challenges concerning inflation and energy use that we all talk about are opening the door to a number of significant changes. Many of these challenges are related to the optimum use of a changing budget and are concerned with such areas as holding mowing cost down and vegetation problems that occur with reduced mowing.

Today's planning of highway chemical prescription programs has changed radically in just 2 years. The flexibility and ingenuity of tank mixes are also becoming more essential for a successful program.

Two years ago, the industry had three flexible materials that were either premixed or tank mixed and were used with other industrial products such as Hyvar, Spike, Krenite, Embark, and MSMA. These last three were used in every season of the year. Now

2,4,5-T is no longer available from Velsicol or other suppliers for right-of-way use. Two broad spectrum chemical tools are left for selective weed and brush control: 2,4-D and Banvel (Dicamba). These two materials are flexible in many common use situations: highway (including ditch bank labeling), utilities, home lawns, corn, pastures, rangeland, railroads, forestry, aquatic, watersheds, soil sterilant, and grass inhabitation areas.

Three new product lines are in various stages of development from Velsicol:

1. Vegatrol DPA (available as an ester or amine) was introduced this year; this product should complement our Vegatrol A4D and LV4D;

2. We will also introduce Banvel C.S.T. (cut-surface treatment) for selective brush control; this material is applied as a ready-to-use concentrate; it contains no 2,4-D and should be used on a freshly cut surface such as tree trunk frill or a freshly cut stump and should be ideal for brush cutting crews; this product will increase our present product line of Banvel XP pellets, 4WS, 720 and Banvel 520 (oil and low oil mixes); and

3. Ravage (Test Code VEL. 5026) is our new total vegetation control product, which has been submitted for approval by the Environmental Protection Agency.

FUTURE IN CHEMICAL ROADSIDE VEGETATION MANAGEMENT Anthony Stacha

Ciba-Geigy markets a number of products that are used in roadside vegetation management programs in the United States. These product formulations are Pramitol 25E, Primitol 5PS, Atratol 80W, Atratol 8P, Aatrix 80W, Aatrix 4L, Aatrix Nine 0, Princep 4L, Princep 80W, and Princep Caliber 90. Due to the diversity of weed problems and rainfall in the United States, the uses of these products vary from complete bare ground control chemicals in some areas to selective control of undesirable species depending on rates used.

Princep has been used for a number of years in the western United States for selective control on highway rights-of-way. Recently, Aatrix has obtained a state label in Oklahoma for a different type of selective control, that is, broadleaf weed control in bermuda grass along the roadsides.

My experience in Texas has been centered around the application of Pramitol 25E under asphalt shoulders to prevent weed and grass encroachment. This use of Pramitol 25E considerably extends the life of these shoulders. Pramitol 25E (under shoulders) can be applied on the ground before laying asphalt by mixing 20-30 gal of Primitol in a minimum of 100 gal of water and uniformly spraying on a well-prepared surface. Pramitol 25E may also be applied at the same rate and may be mixed directly with the cutback asphalts such as RC, MC, and SC. This later program can be applied by the contractor and requires no special equipment and labor. The only additional cost is the cost of the chemical. Tests have shown that the long control of Pramitol 25E under highway shoulders to prevent weed encroachment, thus extending the life of the shoulder, is a very economical program and in some cases appears to double shoulder life.

Currently, registration is pending with the Environmental Protection Agency on Dual 8E alone and as a tank mix with Princep for weed control in field and liner grown woody ornamentals. The granting of this registration offers potential for Dual and