

Aquatic Weed Control With A New Controlled Release Aquatic Herbicide System

R. W. GEIGER AND W. G. PATERSON

3M Company, Pompano Beach, Florida 33064
and
St. Paul, Minnesota 55101

A variety of submersed aquatic weeds has been controlled by a new wetttable powder aquatic herbicide formulation based on endothall (7-oxabicyclo(2.2.1)heptane-2,3-dicarboxylic acid). The new system consists of the dihydroxy aluminum salt of endothall incorporated on a mica carrier. Application is made as an aqueous dispersion. The particles settle through the water and collect on the surface of the aquatic plants. The endothall is released over an approximate 24-hour period.

A unique feature of this product is its low toxicity. The following data were obtained:¹

Acute oral LD₅₀ (rats):

Acute dermal LD₅₀ (rabbits):

Acute dust inhalation toxicity
(rats):

24-hour eye irritation (rabbits):

Skin irritation (rabbits):

4,560 mg/kgm

(formulated basis)

2,020 mg/kgm

no deaths or unusual

reactions

"moderate"

"minimal"

It is notable that although the product contains 13.4% endothall, its acute toxicity is only about 1 percent of that of endothall acid.

This product (commercially known as "3M Brand Aquatic Herbicide System E") also has a low toxicity to fish as shown by the following data:

Bluegill sunfish showed no mortality after 96-hour exposure at 5 ppm (a.e.).² The 96-hour TL₅₀ was in excess of 100 ppm (a.e.) for channel catfish and bluegill sunfish.³ Black bullhead, bluegill sunfish and mosquitofish showed no mortality, or other ill effects after 96-hour exposure at 100 ppm (a.e.).⁴ Although Aquatic Herbicide System E has received rather widespread use in its development, it has never been associated with a fish kill.

Some 25 varieties of aquatic weeds including hydrilla (*Hydrilla verticillata*), Southern naiad (*Najas quadalupensis*), coontail (*Ceratophyllum demersum*), and several pondweed (*Potamogeton*) species have been successfully controlled. Results of treatments of lakes and canals during 1968 and 1969 in various sections of the country will be discussed.

Minnesota Treatments

The herbicide system was applied by mixing with water in a 55-gallon drum to give a 10-20% dispersion, which was then sprayed using a conventional pump.

Island Lake, Ramsey County: The lake has a severe pondweed (*Potamogeton crispus*) and elodea

(*Elodea canadensis*) problem. An isolated 5-acre bay was treated in early June at the rate of 35 lb/A (6 ft. depth). Pondweed was matted at the surface and the lake bottom was covered with immature elodea plants. Although 100% of the pondweed was down within four days, the small elodea plants were observed to be quite healthy. Examination of the area, six weeks later, revealed no elodea problem, whereas adjacent bays were severely infested. A similar situation was observed to exist as late as September 9th.

Lake Riley, Hennepin County: A 6-acre bay, 4 ft. deep, was heavily infested with elodea, coontail, pondweeds (*Potamogeton crispus* and *pectinatus*). Treatment for filamentous algae was made eight days prior to herbicide application. The area was treated with System E herbicide at a rate of 75 lb/A. After a week, control appeared essentially complete on all submersed species. The elodea was defoliated and blackened and reportedly did not grow back during the season.

Big Stone Lake, Big Stone County: At the request of the Minnesota Conservation Department, two 1-acre areas were treated in June 1968, at a rate of 90 lb/A with System E. The areas were infested with pondweeds (*Potamogeton richardsonii* and *pectinatus*) coontail and filamentous algae. When the areas were observed one month later, control was estimated at 95 percent. When the stakes were pulled three months after treatment, no appreciable regrowth had taken place.

Michigan Treatments

Cleveland Creek Impoundment, Muskegon County: A 14-acre area of this impoundment which was infested with *Potamogeton zosteriformis*, *Myriophyllum exalbescens* and *Potamogeton natans* was treated at a rate of 40 lb/A. Control was very satisfactory according to the cooperator, E. Victor Scholl of Modern Weed Control Service, Grand Rapids, Michigan.

The following dosage rates (lbs/A) are suggested for moderate to heavy infestations of some common midwest weeds:

| | |
|-------------------------|----|
| <i>E. canadensis</i> | 70 |
| <i>P. crispus</i> | 35 |
| <i>C. demersum</i> | 70 |
| <i>P. pectinatus</i> | 35 |
| <i>P. foliosus</i> | 35 |
| <i>P. natans</i> | 35 |
| <i>M. exalbescens</i> | 35 |
| <i>P. zosteriformis</i> | 35 |

Florida Treatments

The major problems we have become associated with in our work in Florida have included hydrilla, *Vallisneria americana*, Eurasian watermilfoil (*Myriophyllum spicatum*), chara and filamentous algae. It should be noted here that in some of our work in Dade County with B. L. Hall and Paul Hardy, a broad-leaf pondweed has been noted which is very similar to *Pontamogeton praelongus*.

Lake Virginia, Winter Park: In conjunction with the Hyacinth Control Society Meeting of 1968, a series of 50 x 100 foot plots were treated in late May for control of *H. verticillata*. Treatment was made with R. D. Blackburn, CRD, ARS, USDA, Fort Lauderdale, Florida, using an airboat and conventional piston pump setup. Underwater techniques were used because of the limited area being treated. Observation after 16 days revealed 80% control of hydrilla and vallisneria when a rate of 4 ppmw was used. The latter was not controlled at a rate of 2 ppmw. Control then improved to the 90-100% range after 6-8 weeks and held up through the end of the season (late September) when floating mats of hydrilla began to interfere with interpretation of the test.

Lake Osceola, Winter Park: In order to evaluate this herbicide system on a larger scale, two canal-like areas were staked off in front of the Seminole Hotel. The areas were located 75 feet from shore and measured 300 x 35 x 12 ft. and 390 x 35 x 8.5 ft. and were treated at rates of 4.4 and 2.5 ppmw, respectively. Knockdown of hydrilla was obvious within one week. Control was estimated at 85% in both areas after one month. The plot areas were still under control several months later.

Dade County Canals: Through the cooperation of Dade County officials, our herbicide system is being evaluated in south Florida canals. A 150-gallon fiberglass mixing tank, equipped with a horizontal agitator, proved to be a convenient means for mixing herbicide slurry. The product was sprayed with a John Bean centrifugal pump. Results have been gratifying. One canal, treated in November 1968, did not require further treatment for over six months.

Lake Maitland, Winter Park: In April 1969, we were given the opportunity by the City of Winter Park,

to treat over three miles of shoreline. Treatment width was to be 35 ft. with average depth estimated at 5 ft. (maximum 10 ft. or so). The lake had originally had a dense stand of vallisneria which had been replaced by hydrilla. A survey of the lake revealed the problem to be severe. Individual home owners had special problems because of local, heavy infestations. A spray boat designed to introduce the insoluble wettable powder directly into the spray stream was used to apply the product. The treatment was made over a 3-day period because of adverse wind conditions. The dosage rate used was 3 ppmw (a.e.) System E.

Examination of the treated shoreline two weeks after treatment revealed scattered erratic control. However, after five weeks, control was rated at 75-80%.

Control in many areas extended beyond the 35 ft. limit, running over 100 ft. in some areas. Analysis of water samples for endostall taken at periodic intervals following treatment showed considerable drift of herbicide from the treated areas. This was believed due to wind-induced water currents. The drift of herbicide was responsible for a prompt and general suppression of weed growth well outside the treated areas.

ACKNOWLEDGMENTS

Our special thanks to B. Lamar Hall and Paul E. Hardy for their cooperation in the treatment of Dade County canals and to Jay L. Blanchard and Bruce Nelson for working with us so patiently on the Winter Park Lakes. Thanks also to C. F. Zeiger for his aid in reading and interpreting the Lake Maitland work, and to A. M. Teien, Lake Improvement Consulting Service, Inc., Minneapolis, Minnesota, for his aid in the development of the spraying equipment and in the treatment of Lake Maitland.

LITERATURE CITED

1. Data obtained by Lifestream Laboratories, Libertyville, Illinois.
2. Data obtained by P. P. Economon, Minnesota Department of Conservation, St. Paul, Minnesota.
3. Data obtained by O. B. Cope, Bureau of Sport Fisheries and Wildlife, Columbia, Missouri.
4. Data obtained by J. R. Whitely, Missouri Department of Conservation, Columbia, Missouri.