Aquatic Weed Control In Illinois

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INTRODUCTION

The aquatic plant control research activities of the author began in late summer in 1958. This activity was prompted in part by the development of and the availability of possible new herbicide tools to assist the biologist in the management of the aquatic environment. Since 1958 my associates and I have tested under field conditions a large number of products in various bodies of water in central Illinois.

The results of some of these activities have been published (6, 9, 15). Suggestions for the control of common aquatic plants have been summarized (5). Preliminary reports of part of this work have been presented (1, 4, 7, 10, 12, 14, 18, 19, 22, 23, 24). Progress reports have been presented (2, 3, 11, 13, 16, 17, 20).

The toxicity of these herbicides to bluegills has been investigated; the effect of many herbicides on fish eggs and fish has been reported (8, 21).

MATERIALS AND METHODS

Much of the field testing was conducted in 20 ft^2 areas. The surrounding aquatic vegetation served as a barrier and permitted observations on drift of the herbicide from the application site. In former strip mines, fingers of water from 25 to 50 feet in width were used. Some test areas were established by measuring a 100 foot length of vegetation and applying the herbicide on 20 feet each side of the midline of the test area. Thus, a 4,000 foot test area was easily established. Frequently 100 to 200 foot shoreline areas were treated, and the vegetation would extend from 25 to 50 feet from the shoreline.

Herbicides were applied to test areas in a variety of bodies of water. These include former strip gravel and coal mines and typical farm ponds formed by placing a dam on an existing waterway. Many had diverse uses such as farm recreation, residential development, 4H Camp activities, reflection pool and water supply. They ranged in size

from one circular pond about 25 feet in diameter to a 1,400 acre water supply reservoir. No attempt was made to relate the water quality found in bodies of water used in this study.

All the rates of application presented are based on the active ingredient, except the rates of application for the emersed aquatic plants which are given as a ratio of formulated product diluted to one gallon with water.

RESULTS AND DISCUSSION

Emersed Plant Control

For the most part, emersed aquatic plants are not troublesome, although all or most of the emersed aquatic plants can and will infest shallow areas.

Liquid ester formulations of 2,4-dichlorophenoxyacetic acid (2,4-D) applied to the foliage at a rate of ¼ cup of the liquid (4 lb/gal of acid derivative) ester or amine derivatives diluted to one gallon with water controlled creeping water primrose, *Jussiaea repens glabrescens,* water willow, *Justicia americana,* bulrush, *Scirpus acutus,* and common arrowhead, *Saggitaria latifolia,* the common emersed species in central Illinois. (Note: For several years we applied the herbicides on the basis of area, but to eliminate the time consuming step of estimating irregular areas we shifted to a suggested application containing a ratio of herbicide per gallon of solution which would give satisfactory results.) These species were eliminated by the application of 1 lb of granular 2,4-D per 440 ft².

Broadleaf cattails, *Typha latifolia,* and narrowleaf cattails, *T. angustifolia,* were controlled by applications of liquid ester formulations of 2,4-D, but high rates were required. Applications of 2,2-dichloropropionic acid dalapon (4 oz per gal of water), or 3-amino-1,2,4-triazole, amitrole (2 oz per gal of water) were very effective on both species. Very low rates of 6,7-dihydrodipyrido (1,2a:2',1'-c) pyrazidiinium salt, diquat (10 ml per gal of water), plus either X-77 or common household Joy detergent gave excellent results. Many of these emersed aquatic species help prevent bank erosion and have some value. We are attempting to maintain a stand of cattails to reduce bank erosion yet keep the rest of the shoreline free of cattails.

Submersed Aquatic Plants—Non-Potamogeton

Common coontail, *Ceratophyllum demersum,* and northern watermilfoil, *Myriophyllum exalbescens,* were controlled at a rate of 2 ppmw of granular 2,4-D or 2-(2,4,5-trichlorophenoxy)propionic acid, silvex. Also, these species were controlled by 7-oxabicyclo (2.2.1) heptane-2,3-dicarboxylic acid, endothall, but higher rates were required (3 to 5 ppmw). We have eliminated coontail from the treated areas by the application of 2 ppmw of potassium endothall. Diquat controlled these species at 1 and 0.5 ppmw, respectively.

To date, only diquat has been effective for the control of elodea, *Elodea canadensis* (1 ppmw), both slender naiad, *Najas flexilis,* and southern naiad, *Najas, guadalupensis* (1 ppmw), and white waterbuttercup, *Ranunculus trichophyllus* (0.5 ppmw). Applications of several other herbicides on these species were not effective.

It has been reported to us that waterstargrass, *Heteranthera dubia,* was not controlled by endothall, but we have not verified this as yet. Diquat cation (1 ppmw) eliminated the waterstargrass in the treated areas.

The control of cabomba, *Cabomba caroliniana,* has not yet been achieved. Applications of granular 2-(2,4-dichlorophenoxy)propionic acid, 2,4-DP, at 4 lb per 440 ft² eliminated the cabomba from the treated areas, but 12 weeks were required for complete removal.

Granular 2,4-D, 2,4,5-trichlorophenoxyacetic acid, 2,4,5-T, and silvex were tried at the same rate, but test areas were terminated after approximately 8 weeks. Later applications of granular 2,4-D, 2,4,5-T, and silvex did not give definite results for the control of cabomba 12 weeks after application. Applications of liquid 2,4-D, 2,4,5-T, silvex and disodium endothall at relatively high rates were not effective. Liquid and granular di(N,N-dimethylalkylamine) salt of endothall, Hydrothol 47, applied at a rate of 2 ppmw (endothal content) caused severe top burn but did not give effective control of cabomba.

Submersed—Potamogeton

Sago pondweed, *Potamogeton pectinatus,* leafy pondweed, *P. foliosus,* small pondweed, *P. pusillus,* and curlyleaf pondweed, *P. crispus,* have been controlled in many bodies of water by the application of disodium endothall at 1 ppmw or diquat at 0.5 ppmw. In addition, diquat at 1 gallon per surface acre has given good results on these species. These four pondweeds are the most common in central Illinois.

Floating Leaf Aquatic Plants

American pondweed, *Potamogeton nodosus,* and *P. vaseyi* were controlled by liquid disodium endothall applied at a rate of ¼ cup per gallon of water. American pondweed also was eliminated from test areas by either liquid or granular endothall at a rate of 1 ppmw. Diquat was not effective on American pondweed. The addition of X-77 and other agents did not alter the effects.

Although white waterlily, *Nymphaea tuberosa,* and American lotus, *Nelumbo lutea,* have been controlled within the state by applications of either granular or liquid 2,4-D, spatterdock, *Nuphar advena,* has not been controlled by liquid or granular 2,4-D. Granular applications of 2,4,5-T and silvex (3 lbs per 440 ft²) substantially reduced the spatterdock within the treated areas but did not eliminate the spatterdock. Applications of liquid 2,4-D, 2,4,5-T, silvex, diquat, and granular 2,4-D were not effective. We have tried granular 2,4-D at high rates this year, but it is a little early to know what the results may be.

Duckweed Control

Although we have substantially reduced the duckweed, *Lemna minor,* in many test areas by the application of diquat, disodium endothall, Hydrothol 47 and 2-amino-3-chloro-1,4-naphthoquinone, 06K-50-W, we have not been successful in eliminating duckweed from any of the test areas, even though applications have been repeated and in some test areas repeated many times. Diquat, endothall and Hydrothol 47 have been applied as high as 1 ppmw.

In one small pond we attempted to eliminate the duckweed. We did have the duckweed under control most of the growing season, but in late August the duckweed again covered the water surface. After several applications the duckweed population was severely reduced. A strong south wind had blown the duckweed against the dam, and herbicide was applied in a final effort to eliminate the duckweed, but the pond owner drained the pond for repair and the pond was not refilled the next year. Duckweed has not

reappeared in this pond since 1966. We cannot say if the herbicide or the continued drying out of the pond killed the duckweed.

Pre-emergent Plant Control

Dichlobenil, 2,6-dichlorobenzonitrile, has given very good results for the control of sago pondweed and small pondweed (4 lb/A) and southern naiad (8 lb/A). Dichlobenil was very effective on American pondweed and northern watermilfoil at rates of 8 lb/A applied through the water. Leafy pondweed, however, was not controlled by dichlobenil throughout the growing season when applied to the exposed bottom soil at rates up to 16 lb/A.

Fenac, 2,3,6-trichlorophenylacetic acid, at rates of 10 lb/A gave control of sago pondweed and substantially reduced the stand of southern naiad at 20 lb/A. Fenac at 20 lb/A did not give season long control of leafy pondweed. Since fenac is more effective when applied to the exposed bottom soil, we have been limited in our experimental use of fenac.

Granular 2 chloro-4,6-bis (ethylamino)-s-triazine, simazine, applied to the thawed bottom in December or March was not effective for the control of leafy pondweed at 44 lb/A, and 12 lb/A was not effective on sago pondweed, the highest used on that species. The wettable powder, applied in December, was not effective on leafy pondweed at rates up to 40 lb/A.

Granular 2-chloro-4-ethylamino-6-isopropylamino-s-triazine, atrazine, applied at rates up to 48 lb/A was not effective on leafy pondweed. Atrazine at 16 lb/A was not effective on sago pondweed, the highest rates used on sago pondweed. Wettable powder of atrazine applied at rates of 20 lb/A was not effective.

Algae Control

While we suggest the use of copper sulfate for the control of filamentous algae, we have tested other herbicides for their control. The filamentous algae in three ponds were eliminated after the application of wettable powder of simazine and the ponds remained relatively free of filamentous algae from May through August. Rates used have ranged from 0.2 ppmw to 0.8 ppmw and confirmed by analysis of the simazine content of the water.[1] In most of these experiments we applied simazine until the algae disappeared and would apply simazine when filamentous algae began to appear. During our first season of testing simazine we were successful at the lower rates, but in 1967 the higher rates were required.

In one pond, Sanford Pond, a dense stand of elodea also disappeared in two successive years. Chara, *Chara vulgaris*, however, became the predominant species.

Chara is probably the most abundant aquatic plant in central Illinois as it is present in many bodies of water in which we have conducted tests on other aquatic plants. In some bodies of water after substantially altering the aquatic plant complex, chara became the predominant aquatic plant.

Preemergent applications of dichlobenil at 4 lb/A have given season long control of chara. We have eliminated chara in a total pond application of 1 ppmw of the wettable powder of dichlobenil. Post-emergent applications of dichlobenil to small test areas (400 ft^2) were not effective.

Large scale applications of liquid Hydrothol 47 at 0.4 ppmw eliminated the chara from the test areas. However, some loss of small fish occurred. Granular Hydrothol 47 was not effective in small test areas (400 ft^2) when the application rate was below 2 ppmw.

[1]Water analyzed by Geigy Chemical Company.

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