Progress Report On The Control Of Elodea In Dade County, Florida Canals With Diquat

JOHN W. MACKENZIE

Technical Specialist, Herbicides,

Chevron Chemical Company, Ortho Division,

Richmond, California

SUMMARY

Preliminary results are presented from one laboratory trial and five field trials where 6,7-dihydrodipyrido-(1,2-a: 2',1'-c)-pyrazidiinium salt (diquat) was applied for control of American elodea *(Elodea canadensis* Michx.) in southeast Florida. Results from a growth room study suggest that control of elodea obtained with diquat is not affected by algal and marl deposits. Water quality, water temperature, time and method of application did not affect the results of field treatments with diquat. Studies are being continued in an effort to define the effect of water flow and plant density on control of elodea by diquat in southeast Florida.

INTRODUCTION

6,7-Dihydrodipyrido—(1,2-a:2',1'-c)-pyrazidiunium salt (diquat) has been effectively utilized in the United States for the control of submersed weeds (1). Blackburn and Weldon (2) have reported excellent control of southern naiad (*Najas guadalupensis* (Spreng.) Magnus) in Florida drainage and irrigation channels after application of diquat at 1.0 ppmw. In recent years, American elodea has invaded many canals in Dade County, Florida. Mechanical weed control has been practiced in this area in an attempt to control the growth of this species. Diquat at a rate of 0.5 ppmw has been used in certain of these canals since 1963 on an operational basis. At 0.5 ppmw, diquat has given complete control of elodea for a minimum period of one year in Ludlam Glades Canal, Coral Gables Loop Canal and Comfort Canal. Diquat at 0.5 ppmw gave only one to three months control of elodea in the canals of Carol City and Westwood Lakes. This variation in results was the reason for the establishment of this study.

MATERIALS AND METHODS

Trials were conducted between January and April, 1966 in Dade County, Florida. The canals utilized in the study were under the supervision of the Water Control Division, Public Works Department, Dade County Metropolitan Authority and the Central and Southern Florida Flood Control District. The canals were located from Andover in the North of the county to Westwood Lakes in Central Dade County. In South Dade County, elodea is not found in any quantity.

At the USDA laboratories, Plantation Field Station, Fort Lauderdale, Florida, the effect of diquat on elodea with marl and algal deposits and on hand-cleaned elodea was compared, using the methods of Blackburn (3) in a temperature-controlled growth room. Diquat was applied at 0.25 and 0.5 ppmw to plants gathered from Canal Trials II and III. Each treatment was replicated three times. Visual evaluations of the effect of the chemical were made at two, four and six weeks after treatment.

Eighteen field trials have been established in the above-

mentioned canals. Results from five of these trials, where diquat was applied at 0.5 ppmw, will be discussed in this paper. Application of the chemical was made from a boat propelled by an airmotor. The chemical was applied to the water by 1. spraying a dilute solution onto the water, 2. injecting a dilute solution into the water at various depths, or by a combination of both methods. A 100 gallon spray tank fitted with mechanical agitators was utilized for application of the materials.

At all sites the temperature, turbidity, pH, alkalinity, dissolved oxygen content, total nitrate, total phosphate, total hardness and calcium hardness of the canal water were measured. Flow was determined visually in each canal at time of application and at subsequent evaluation dates. A visual evaluation of the canal flora was made before treatment and at various dates following treatment. Results were based on estimated percent reduction of weed population.

The five canals referred to above varied from 30 feet to 85 feet in width and from 6 feet to 20 feet in depth. During the period of the trials, water temperature rose from 67°F to 80°F and the pH ranged from 6.7, in one isolated instance, to 8.7. Total hardness, calcium hardness and alkalinity values rarely fell below 150 ppm ($CaCO_3$). In a given canal the waters tended to be uniform in quality except where pollution from sewage outlets and other sources was present. Three of the five canals were found to have a high content of nitrates and phosphates. In the other two canals, nitrate and phosphate readings were approximately normal, ranging from 0.18 to 0.31 ppm and from 0.02 to 0.04 ppm respectively.

Deposits of algae and marl on the elodea were noted in the many of the treated canals.

RESULTS AND DISCUSSION

It must be stressed that the results reported below are preliminary. No attempt is made in this paper to draw final conclusions from the data.

Laboratory Study

Table 1 contains the results from the study in the growth room where the effect of diquat on cleaned and non-cleaned elodea from two canals (Trials II and III) was compared.

Table 1. Effect of Diquat on Cleaned and Non-Cleaned Elodea from Two Canals as Percent Control.

	% CONTROL					
	CLEANED ELODEA			NON-CLEANED ELODAE		
Diquat ppmw	14 days	28 days	42 days	14 days	28 days	42 days
Trial II — Heavy Algal and Medium Marl Deposits						
0.5	53	87	94	80	96	100
0.25	87	93	95	73	81	86
Check	8	13	13	—	—	—
Trial III — Heavy Algal and Medium Marl Deposits						
0.5	93	99	99	60	96	98
0.25	47	97	98	70	93	93
Check	3	12	17	—	—	—

The results from Trials II and III indicate that control of elodea by diquat is not affected by deposits of algae and marl. The deposits as given in Table I refer to accumulation of algae and marl on the elodea at the time of collection, but it must be noted that a reduction in deposit occurred in the process of establishing the samples in the laboratory.

Field Trials

The data presented in Table 2 suggest that there is no relationship between water quality, water temperature, time and method of diquat application and the degree of elodea control obtained using a standard 0.5 ppmw rate of diquat. It is shown in Table 2 that unsuccessful treatments were made in Trials II and IX. Yet the application data for Trial II is similar to that for successful Trial I. Conditions at time of application of successful Trial XI are similar to those relating to unsuccessful Trial IX. However, conditions for Trial XI were dissimilar to those for Trial I.

Preliminary observations indicated that water flow in the canal and the relationship of elodea density to rate of chemical may affect the success of a diquat application. Studies are being continued to confirm these observations.

Table 2. Relationship of Control of Elodea by Diquat at 0.5 ppmw in Five Canals to Application Conditions.

		Treatment		Time of		°F		PPM Units			Dis -
Trial	Percent Control	Date	Weather	Day	Meth	Tem	pH	Turb	Total Hard	No3	solved Oxy
I	100	Jan. 18	Sunny	9-10 a.m.	Hose on	68	8.4	20	210	1.28	7.0
II	65	Jan. 19	Sunny	9-10 a.m.	Hose on	64	8.4	9	170	0.80	3.0
VIII	98	Mar. 1	Sunny	2-4 p.m.	Hose on	70	8.2	23	230	1.11	3.0
IX	10	Mar. 4	Cloudy	2-4 a.m.	Inject	73	8.3	18	175	0.31	7.0
XI	100	Mar. 11	Cloudy	2-4 p.m.	Inject	73	7.8	11	220	0.18	5.0

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Little correlation has been observed between efficacy of diquat application and deposits on elodea in field trials.

Further evaluation of the trials will be made throughout the season. Studies on the uptake of diquat by elodea are in progress at the University of California, Davis. The structure of the membranes of elodea is also under study at the same institution.

Further work is being carried out by R. D. Blackburn, USDA, Ft. Lauderdale. Field work is also underway with the Metropolitan Authority of Dade County.

It is hoped that the final outcome of these studies will lead to a further understanding of control methods for elodea.

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