PRELIMINARY INVESTIGATIONS OF THE USE OF AQUALIN FOR COLLECTING FISHES

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ABSTRACT

Bioassays were conducted with Aqualin, a herbicide manufactured by the Shell Chemical Company, to investigate its possibilities in collecting fishes from lotic waters as well as to determine its relativity to toxicity to five species of fishes. A narrow range of toxicity was found between the largemouth bass, bluegill, bowfin, mosquitofish, and the fathead minnow. The 24-hour TL_m (median tolerance limit) values ranged from 0.062 to 0.183 ppm at 71° F. Bowfin were the most sensitive fish tested. Aqualin was found to be less toxic than rotenone in short exposures; however, a lethal dose of either was required to effectively repel fishes. It was concluded that there is a narrow range of susceptibility between different species of fishes to Aqualin and that, in no case, was it sufficiently wide to indicate any promise for collecting fishes in lotic waters.

INTRODUCTION

Bioassays and repellent tests were conducted with Aqualin at the Fayetteville Fishery Research Laboratory to evaluate its potentialities for collecting fishes in lotic waters as well as to determine its relative toxicity to five species of fishes.

Aqualin is a clear, colorless liquid herbicide produced by the Shell Chemical Company. The product contains 85 percent, by weight, of its major constituent, acrolein (CH_2=CH—CHO) (Shell Chemical Company, 1959). Aqualin polymerizes slowly in the presence of air, forming an insoluble white precipitate. Its vapor is highly irritating, and in sufficient concentration, it is toxic to mammals.

Interest in Aqualin as a fish repellent has developed over the past two years. The first published work with Aqualin as a piscicide was done on the Raccoon River in Iowa by the Iowa State Conservation Commission (Harrison, 1961). Here Aqualin was used successfully to drive fishes downstream into a weir. Further work in several Iowa streams proved inconclusive, with the mortalities associated with different applications varying between a few minnows and an estimated five percent of the entire fish population. Because of the inconsistent findings, further work was terminated.

Green (1960) found that carp, *Cyprinus carpio* Linnaeus, and threadfin shad, *Dorosoma petenense* (Gunther), could be killed with 1.0 to 2.0 ppm Aqualin. Largemouth bass, *Micropterus salmoides* (Lacepede), and the bluegill, *Lepomis marcrochirus* Rafinesque appeared to tolerate up to 5.0 ppm without evident harm, Moen (1961), however found Aqualin quite toxic to fish when concentrations as weak as 0.5 ppm were applied to a pond. Moen also found that Aqualin quickly disappeared from the pond. Meyer (1961) found that catfish, *Ictalurus sp.*, and sunfish, *Lepomis sp.*, were killed by concentrations from 1.0 to 2.0 ppm Aqualin and that the buffalo, *Ictiobus sp.*, succumbed at 0.2 ppm.

METHODS

The bioassay procedure used in this study was that recommended by the American Public Health Association Standard Methods (1960).

Five species of test fishes were used in the comparative toxicity studies; these were: largemouth bass; bluegill; bowfin, *Amia calva* Linnaeus; mosquitofish, *Gambusia affinis* (Baird and Girard); and fathead minnow, *Pimephales promelas* Rafinesque. The largemouth bass used in the bioassays ranged from 2 to 2½ inches in length and 1 to 2 grams in weight; the bluegill from 1¼ to 1½ inches (weight 1 gram); the bowfin and mosquitofish from 1 to 1¼

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inches (0.8 gram); and the fathead minnows from 1¾ to 2 inches (1 to 2 grams). All test fish were hatchery reared except the bowfin.

Ten fish of each species were used in duplicate 2-gallon jars containing 0.1, 0.25, 0.5, 0.75, 1.0, and 2.0 ppm Aqualin. Each jar was aerated continuously and maintained at approximately constant room temperature (69°-72° F.) throughout the experiment. Fish reactions were observed for a 96-hour period for the largemouth bass and bluegill and for 48 hours for the mosquitofish and fathead minnows. The bowfin test data used in this report was restricted to 24 hours because of the poor condition of both experimental and control fish at the end of the 48-hour period.

Chemical determinations of dissolved oxygen, free carbon dioxide, total alkalinity, pH, and hardness were made before and after each test. Over the course of the individual experiments, the dissolved oxygen concentrations varied between 7.6 and 6.2 ppm, pH 7.2 to 7.3, total alkalinity 89 to 93 ppm, hardness 40 to 41 ppm, and free carbon dioxide 6.2 to 7.1 ppm.

Experiments were conducted to observe the comparative physical reactions of fish to Aqualin and to rotenone. These tests were conducted in a stainless steel tank 13 feet long and 28 inches wide, with an effective depth of 6.2 inches. A trap made of 20-mesh screen was installed in one end of the tank. A uniform flow of water was passed through the tank, the 20 test fish (largemouth bass) were added and, after a two-hour acclimation period, predetermined concentrations of Aqualin and rotenone were applied to the other end of the tank. Observations were made on the fish to determine their reactions to the chemicals during a 2-minute exposure period, after which the test fish were removed and placed into aerated fresh water. Observations were continued for 24 hours to observe the after effects of this exposure.

RESULTS

The experimental data summarized in Table I reveal comparatively little difference between the 24- and 96-hour TL_m values at the test temperature. Bowfin were the most sensitive of the five species of fishes tested having a 24-hour TL_m value of 0.062 ppm. This possibly was due to the physiological condition of the wild fish. Bowfin were followed in order of decreasing susceptibility of bluegill, mosquitofish, fathead, and largemouth bass with TL_m values of 0.14, 0.15, 0.15, and 0,18 ppm, respectively.

TABLE I

COMPARATIVE MEAN TL_M (MEDIAN TOLERANCE LIMIT) VALUES FOR AQUALIN 69°-72° F.

Test Animals	*Range of Length (inches)*	*Approx. weight (grams)*	*Number Test Animals*	*TLm (ppm) 24 hrs.*	*48 hrs.*	*72 hrs.*	*96 hrs.*
Largemouth bass	2 -2½	1.5	10	0.183	0.163	0.160	0.160
Bluegill	1¾-1½	1.0	10	0.140	0.125	0.100	0.100
Bowfin	1 -1¾	0.8	10	0.062	....	....	....
Mosquitofish	1 -1¼	0.8	10	0.149	0.061	....	....
Fathead minnow	1¾-2	1.5	10	0.150	0.115	....	....

A comparison was made with emulsifiable rotenone (5%) and Aqualin to evaluate the reported repellent effects. Increasing concentrations of Aqualin and rotenone were used to determine the lowest concentration needed to repel fish into a fixed area within the tank. It was found that 7.1 ppm rotenone at 71° F. was needed to drive all the fish into the trap, while 9.6 ppm of Aqualin was required to produce the same effect. After the fish were driven into the trap they were removed and placed in fresh water for 24 hours. It was found that no mortality occurred in fish exposed to less than 4.0 ppm Aqualin (exposure time two minutes), whereas all fish died within 24 hours after an exposure to 0.5 ppm rotenone. It appears that Aqualin is less toxic than rotenone for short periods of time; however, it requires a lethal dose of both chemicals to effectively repel fishes.

CONCLUSIONS

1. Largemouth bass were the most tolerant whereas bowfin were the least tolerant to Aqualin of the fishes tested.

2. There is a narrow range of susceptibility of different species of fishes to Aqualin.

3. Aqualin is not suitable for collecting fishes in lotic waters because it requires a lethal dose to repel all fish.

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A DESCRIPTION AND SOME RESULTS OF A FLORIDA STATE WIDE FISH TAGGING PROGRAM

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ABSTRACT

During the period 1960-1962 a state-wide fish tagging program employing substantial rewards to sport fishermen for tag returns was conducted in Florida. A total of 19,470 fish including 5,328 largemouth bass were captured, tagged, and released. There were 24.2 percent of the tagged bass, 4.5 percent of the bluegill, 3.8 percent of the shellcracker, and 8.9 percent of the crappie returned.

Little difference in returns was noted between fish which were transported prior to release and those which were released into the waters from which they were captured.

INTRODUCTION

During the period 1960-1962 a state-wide fresh water fish tagging study was conducted in Florida. Prior to this time, fresh water tagging studies in Florida were limited to a few areas of the state and were primarily concerned with the Florida largemouth bass (DeQuine, 1949; Herke, 1959; Moody, 1960; Freeman, undated). These past studies were conducted only within the drainage area of the St. Johns River.

In order to obtain general state-wide estimates of harvest rates and other information derived from tagging studies, it was desirable to release tagged fish into many of the diversified waters of the state.

The Joseph Schlitz Brewing Company made such a study possible by their offer to sponsor the program.

METHODS

Fish used in the study were caught by the use of an A.C. electrical fish shocker with a design similar to that of Loeb (1957). Captured fish were placed in a live well, measured, tagged and released.

The shocker unit consisted of a 14-foot, flat-bottom, plywood, scow type, fiber-glassed boat and was equipped with a live well having a capacity of 100