APPENDIX - I

Some aspects of biological and chemical methods of controlling *Hydrilla* in nursery tanks used for fingerlings or *ophiocephalus punctatus*

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Introduction

*Ophiocephalus punctatus* is a commercially important table fish because of its edible qualities and high nutritive value. Generally fry of *O. punctatus* are collected for culturing them in fresh water tanks until they grow into fingerlings. The fingerlings are then collected by dropnets from the nursery tanks and distributed to Panchayat Tanks for harvest.

The nutritional requirements of the fingerlings are very exacting and hence natural tanks with an inlet and an outlet are used as nursery tanks. As the fingerlings reach a size of 7.6 cm they are ready for distribution to Panchayat Tanks. If they are not collected at this stage, the entire stock may be lost due to flooding by rains.

The growth of *Hydrilla* in the nursery tanks may:

1. Harbour predatory insects like *Nepa* and *Belostoma* and Gastropods;
2. Impede the proper netting at the time of gathering the fingerlings.
Biological Control Measures:

Carps (Girrhing spp.) are voracious feeders of Hydrilla. Hence culturing of Cirrhina in the nursery tanks could serve two purposes: 1. Control for Hydrilla and 2. Cirrhina fry may serve as a food for larger fingerlings of Q. punctatus.

Etroplus suratensis is another biological agent that can be used for controlling of Hydrilla. This fish is essentially an inhabitant of brackish water, but is adaptable to fresh water tanks, as shown by its proliferation in Veeranam Tank in the South Arcot District.

Chemical Control Measures:

The Melanainari Tank at Pudukkottai in the Tiruchirapalli District covers 1.6 ha and has a maximum depth of 2.43 m. In 1959, the Department of Hydrology made an attempt to eradicate Hydrilla growth in this tank. This is the only known attempt made to control Hydrilla by chemical means in the district.

A commercial chemical Deco-Tox 500 ml was dissolved in a bucket of water and hand sprayed with the help of a raft. Seven days after the application of Deco-Tox, it was observed that the plants had turned brownish in colour. The control was also temporary because in 2 months Hydrilla again became luxuriant.
Present Investigations:
The present work was undertaken with the following objectives: 1. To find out a chemical agent which can effectively eradicate Hydrilla. 2,4-D was chosen to determine the optimum concentration needed to control Hydrilla and 2. To find out the maximum concentration of 2,4-D that can be tolerated by Q. punctatus and its effects if any.

Materials and Methods:
A stock solution containing 2,4-D in the ratio of 100 mg per litre was prepared. From this stock solution dilutions were made containing 0.1, 1.0, 10, and 25 mg of 2,4-D per liter. These solutions were taken in 400 ml beaker and a control was maintained using ordinary water. Fresh twigs of Hydrilla of approximately equal lengths (about 5.24 cm) were introduced individually in each of the beakers containing the different solutions.

Fingerlings of Q. punctatus of approximately equal size were chosen, and in each beaker a fingerling was introduced. The beakers were all kept in a well lit place so that all received equal illumination.

After 48 hr of treatment the various treated twigs of Hydrilla were put in beakers each containing 400 ml of pound water, and the rate of photosynthesis was measured. An inverted funnel attached to a burette with a rubber tubing was used to collect oxygen.
Oxygen evolved by each twig was recorded at 15 minute interval (Table 1).

Total soluble carbohydrates in treated plant materials were estimated. For this, 3 mg dry plant material was taken and 1 ml of 5% phenol and 5 ml of conc. sulphuric acid was added. The solution was made up to 11 ml by adding distilled water and the optical density of this solution was read in a colorimeter with a blue-green filter and the concentration was determined with the help of a standard curve.

To determine whether 2,4-D had any deleterious effect on the fingerlings, they were killed 48 hr after the treatment and the total soluble carbohydrate content in the tissue was determined.

Results:

After 48 hr of the treatment the plant treated with 100 mg/litre solution was found bleached and photosynthesis stopped completely as shown by the lack of oxygen evolution (Linser and Kirmayer, 1957). The total soluble carbohydrate content of this plant was found to be 0.271% of dry weight compared to 0.524% dry weight in the control (Table 2). The rate of photosynthesis in other treated plants showed a proportionate decrease with the increase in the concentration of 2,4-D (Freeland, 1949, 1950 and Loustalot and Mazik, 1953) as compared to that of the control plant (Fig. 1).
After ninety six hours with 25 mg/litre bleached the plants and they show the tendency to break into pieces at the nodes (Haccius and Nies, 1958). This fragility was also noticed in plants treated with 10 mg/litre.

Microscopic examination of the leaves showed that the chloroplasts were bleached and cytoplasmic streaming inside the cells was sluggish (Carrol, 1949). The plant treated with 25 mg/litre solution stopped photosynthesis. The total carbohydrate content of plant tissue after 96 hours treatment with the 25 mg/litre was found to be 0.17 % of dry weight (Table 2) (Seller et al., 1949; Veller et al., 1950).

By the seventh day after the commencement of treatment, the plant treated with 10 mg/litre was dead, whereas the plants treated with 1 mg/litre and 0.1 mg/litre showed increased growth. The internodes in the latter were much elongated and the growth rate was greater than in control plant.

Ophiocephalus punctatus is not visibly affected by treatment by 2,4-D. The total carbohydrate contents of the treated fingerlings did not show any significant variation.

Summary:

At a concentration of 100 mg/litre, 2,4-D kills Hydrilla within 48 hours. At a concentration 25 mg/litre it takes