

TOXICITY OF FOUR THERAPEUTIC COMPOUNDS TO FRY OF INDIAN MAJOR CARPS

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Toxicity of four therapeutic compounds, viz; sodium chloride potassium permanganate, potassium dichromate and acriflavine to fry of *Catla catla*, *Labeo rohita* and *Cirrhinus mrigala* was tested. Bio-assays were conducted in 5 and 10 litre glass jars in the laboratory for periods of 24 and 48 hours at temperatures of 26° and 32°C. LC₅₀ values of the chemicals were in the ranges of 5500 to 7500 ppm, 37.5 to 48 ppm, 92.5 to 125 ppm and 47.5 to 80 ppm respectively. The results obtained are of value in evolving cheap control methods against some common fish diseases. Sodium chloride and acriflavine can be widely used for chemotherapy and potassium dichromate is preferable to potassium permanganate for prophylaxis.

INTRODUCTION

Very little work has so far been done in India on 'chemotherapy' of fishes. The importance of controlling parasites and diseases of cultivated fishes of the country has been recognised in the present context of production-oriented fishery research programmes in the country. In this connection emphasis has naturally to be laid on evolving cheap and efficient disease control methods. Screening of popular chemical compounds used in chemotherapy of fishes is an essential pre-requisite for this purpose. The present study, therefore, was undertaken to determine the toxicity of four therapeutic compounds to fry of Indian major carps viz. *C. catla*, *L. rohita* and *C. mrigala*.

MATERIALS AND METHODS

Fry of *C. catla*, *L. rohita* and *C. mrigala* were procured from different sources and those found healthy were quarantined for 15 days prior to experimentation. The length and weight ranges of the experimental fishes were

| | | |
|-------------------|----------|------------|
| <i>C. catla</i> | 22-47 mm | 0.3-0.8 g |
| <i>L. rohita</i> | 25-49 ,, | 0.2-0.9 ,, |
| <i>C. mrigala</i> | 24-48 ,, | 0.2-1.3 ,, |

The tests were conducted in 5 and 10 litre glass jars in the laboratory. Dissolved oxygen, pH, total alkalinity and temperature were within ranges of 4.5-5.5 ppm, 7.8-8.2, 193-322 ppm and 28-32°C respectively. Water was free from permanent hardness.

Each test included different concentrations and number of fish tested varied from 2 to 10 depending on the nature of trial, viz; initial or final and keeping the total weight of fish within 1g per litre of water.

Concentrated stock solution in distilled water of each chemical was prepared first and added to the test jars in the required dosages.

Observations on survival and mortality of fish were recorded after 24 and 48 hours. Either the total mortality or 50% mortality of fry were recorded depending on the type of the test. The data were then analysed to determine the concentration of the chemical producing 50% mortality (LC₅₀) of fry following Litchfield and Wilcoxon (1949).

RESULTS

All the compounds under test were found to be toxic to *C. catla*, *L. rohita* and *C. mrigala* and the LC₅₀ values observed are given in tables I and II.

Effects of sodium chloride and potassium permanganate were found to be uniform in all the species whereas effects of potassium dichromate and acriflavine varied specieswise. Potassium permanganate was found to be most toxic closely followed by acriflavine, where LC₅₀ values were within the ranges of 37.5 to 48 ppm and 47.5 to 80 ppm respectively. Effect of potassium permanganate was found to be excellent in controlling the infection of *Gyrodactylus* sp and *Dactylogynus* sp. whereas acriflavine could check the initial infection of tail rot in laboratory experiment. Potassium permanganate at a dose of 2 ppm when applied in rearing ponds thrice in a week could check the infection of monogenetic trematodes and dropsy within a period of one and a half months. In field application acriflavine could not check the infection of tail rot when the fishes were badly affected. LC₅₀ value of potassium dichromate was within the range of 92.2 to 125 ppm to fry of Indian major carps. In laboratory condition it was noticed that this chemical could

TABLE I TOXICITY OF FOUR THERAPEUTIC COMPOUNDS TO CATLA, ROHU AND MRIGAL AT 26°C

| COMPOUND | Catla LC ₅₀ | | Mrigal LC ₅₀ | | Rohu LC ₅₀ | |
|------------------------|---------------------------|-----------|----------------------------|-----------|--------------------------|-----------|
| | At 24 hrs | at 48 hrs | at 24 hrs | at 48 hrs | at 24 hrs | at 48 hrs |
| | Sodium chloride | 7500 ppm | 6000 ppm | 7500 ppm | 6000 ppm | 7500 ppm |
| Potassium dichromate | 125 " | 110 " | 110 " | 110 " | 100 " | 95 " |
| Potassium permanganate | 48 " | 40 " | 48 " | 40 " | 48 " | 40 " |
| Acriflavine | 60 " | 50 " | 65 " | 55 " | 80 " | 70 " |

TABLE II TOXICITY OF FOUR THERAPEUTIC COMPOUNDS TO CATLA, ROHU AND MRIGAL AT 32°C

| COMPOUND | Catla LC ₅₀ | | Mrigal LC ₅₀ | | Rohu LC ₅₀ | |
|------------------------|---------------------------|-----------|----------------------------|-----------|--------------------------|-----------|
| | At 24 hrs | at 48 hrs | at 24 hrs | at 48 hrs | at 24 hrs | at 48 hrs |
| | Sodium chloride | 7250 ppm | 5500 ppm | 7250 ppm | 5500 ppm | 7250 ppm |
| Potassium dichromate | 120 " | 105 " | 105 " | 97.5 " | 95 " | 92.5 " |
| Potassium permanganate | 45 " | 37.5 " | 45.0 " | 37.5 " | 45 " | 37.5 " |
| Acriflavine | 55 " | 47.5 " | 60 " | 52.5 " | 70 " | 65 " |

better act as prophylactic. Sodium chloride was found to be least harmful among the four therapeutic compounds mentioned above. 3% sodium chloride solution could check the infection of *Trichodina* sp. and monogenetic trematodes in both laboratory and field conditions. In this strength *Gyrodactylus* sp. was found dead when the fish was given a bath for 10 minutes. In rearing ponds the infection of monogenetic trematodes and *Trichodina* sp could be completely checked when both dip treatment in 3% followed by group treatment in 0.5% of sodium chloride solution were applied.

LC₅₀ values of the four chemical compounds were determined at 26°C and 32°C and it was always observed that the values varied due to differences in temperature.

DISCUSSION

Dip treatment in 2-5% sodium chloride solution for fishes infected with protozoan and monogenetic trematode parasites had been suggested by earlier workers (Davis 1956, Gopalakrishnan 1963, 1964 and 1967, Tripathi 1954 and '57 and Van Duijn 1956). LC₅₀ values of this chemical were within the ranges of 5500-7500 ppm for carp fry at temperatures of 26°C and 32°C. In field treatment it was also found that this chemical could be used as prophylactic at a dose of 5000 ppm when fish size was more than 25 mm. As such it may be suggested that dip treatment in 3% followed by group treatment in 0.5% sodium chloride solution would be advantageous in combating the diseases like Trichodiniasis, Gyrodactylosis and Dactylogyrosis.

Potassium permanganate at a dose of 2, 3 and 4 ppm was used as a general prophylactic and its effect on *Trichodina* and monogenetic trematodes was found to be excellent (Allison 1957). But Van Duijn (1926) was of opinion that "an excessive dose of permanganate will kill

fishes, while perfectly safe dose is frequently not strong enough to guarantee a cure". However, LC₅₀ values of this chemical were found to be ranging from 40 to 48 ppm when the fish sizes varied from 25 to 49 mm. In rearing ponds 'group' treatment at a dose of 2 ppm applied thrice in a week for a period of one and a half months could check the infection of monogenetic trematodes and dropsy. As such it would be of worth to mention that the cumulative effect of the repeated applications of this chemical at a dose of 2 ppm had no adverse effect on fishes but on the contrary yielded better result.

Van Duijn (*loc. cit*) infers that potassium dichromate is safe at a dose of 50 ppm if it is not used for more than 10 days. In the present set of experiments mortalities were recorded within 48 hours at a dose of 30 ppm though LC₅₀ values were within the ranges of 95 to 125 ppm for carp fry. In laboratory condition it was observed that this chemical could act better as prophylactic than any particular cure. This is in agreement with Van Duijn (*loc. cit*) who observed that potassium dichromate has a hardening effect on the skin of the fish which increases its resistance to further outbreaks of infection.

Wilford (1967) found that LC₅₀ values of acriflavine were within the ranges of 10-100 ppm for rainbow, brown, brook and lake trout. The present observations showed that LC₅₀ values ranged from 47.5 to 80 ppm for Catla, Rohu and Mrigal fry. It was also found that this chemical was having very toxic effect to the fry of Indian major carps and all the fry died within 24 hours when treated with a dose of 20 ppm. In field this chemical could not control the infection of tail rot when fishes were badly affected but in laboratory condition it could check the infection at the initial stage.

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