

***Croton tiglium* (Linn) Seed as an Ideal Eradicator of Pests and Predators in Fish Farms**

O. DIVAKARAN and N. BALAKRISHNAN NAIR

Department of Aquatic Biology and Fisheries, University of Kerala, Trivandrum - 695 007

The toxicity of *Croton tiglium* seed is very effective in the eradication of most of the aquatic fauna except a few species of hard shelled crustaceans such as crabs and prawns which are resistant to even very high concentrations of it. Its toxicity ranged between 0.4 and 2.2 p.p.m. for different species of fishes. Application of homogenised *C. tiglium* seed at the rate of 10 kg/ha (0.5 m depth) is found effective for the eradication of aquatic pests and predators of fish farms. While its toxicity lasts for 5–8 days in still water ponds, it is only for 1–3 days in tidal ponds with frequent replenishment of water. This method is thus most useful for the initial preparation of the ponds for pisciculture.

Success of culture fishery both in the open and closed systems depends mostly on the control of pests and predators. Fish farmers and aquaculturists have long been trying a multitude of pest and predator eradication measures with varying degree of success. However, it is only in recent years that attention has been paid to the solution of this problem on a scientific basis. The contributions of Hall (1949); Rabinal & Hosillos (1957); Hickling (1971); Hora & Pillay (1962); Pillai (1962); Konar (1964) and Tang (1967) are noteworthy in this context. A pest and predator control measure should be effective, easy to practise and without long-term toxicity. It should be economical with the materials readily available. However, none of the methods as such suggested by the above authors fulfil all these requirements. The present paper describes a simple at the same time effective method for the eradication of aquatic pests and predators in fish farms.

Materials and Methods

In order to ascertain the efficiency of *Croton tiglium* seed in the eradication of aquatic organisms the following studies were carried out. The toxicity of the seed on fishes and prawns under the laboratory condition was studied by using wide mouthed 20 l plastic containers for specimens up to 20 cm long, and 100 l containers for larger specimens. In one set of experiments

(Test 1) known quantities of the seed were homogenised in water and then made up to known volumes. Subsamples of these solutions were later used to make varying concentrations ranging from 0.1 to 2.5 p.p.m. with an increment of 0.1 p.p.m. About 50 species of fresh and brackishwater fishes and prawns were subjected to the above grades and the toxic effect on them was observed for about 24 h. Three to five trials were made for each species and 5 to 25 specimens were used in each trial. The average values are presented in Table 1. Since the present work envisages the complete eradication of organisms, the lethal concentration is expressed as p.p.m. for 100% mortality. To study the toxicity under field conditions, 2 ponds of 0.1 hectare and another one of 0.5 hectare size with an average water depth of 0.5 m were selected (Test 2). These ponds contained assorted groups of brackish water organisms. After closing the water passages of these ponds, homogenised seeds of *C. tiglium* were applied at the rate of 5, 10 and 15 kg/ha. The seeds were finely homogenised into a paste and then mixed with dry sand and broadcast over the surface from the bank. The rate of mortality of the different faunal elements was observed for about a week. In yet another study (Test 3A) the residual toxicity of the homogenised seeds in still water ponds was checked. For this, two ponds of 0.01 ha with average depth of 0.5 metre were selected. About

Table 1. Lethal concentration of homogenised *Croton tiglium* seed for different species of fish

Genus/species	Solution, p.p.m. for 100% mortality
<i>Stolephorus indicus</i>	0.4
<i>Chanda gymnocephalus</i>	„
<i>Chanda commersonii</i>	„
<i>Etroplus suratensis</i>	0.6
<i>Amblypharyngodon molitrix</i>	„
<i>Puntius vittatus</i>	„
<i>Etroplus maculatus</i>	„
<i>Xenentodon cancila</i>	„
<i>Nandus nandus</i>	0.8
<i>Catla catla</i>	„
<i>Puntius sarana</i>	„
<i>Megalops cyprinoides</i>	„
<i>Chanos chanos</i>	„
<i>Labeo rohita</i>	„
<i>Cirrhina mrigala</i>	„
<i>Amblypharyngodon melettinus</i>	„
<i>Gerres filamentosus</i>	„
<i>Mugil parsia</i>	„
<i>Mugil cephalus</i>	„
<i>Puntius amphibius</i>	„
<i>Glossogobius giuris</i>	1.0
<i>Mystus oculatus</i>	„
<i>Pisodonophis cancrivorus</i>	„
<i>Oligolepis acutipennis</i>	„
<i>Anabas testudineus</i>	„
<i>Macropodus cupanus</i>	1.2
<i>Eleotris</i> sp.	„
<i>Aplocheilus lineatus</i>	„
<i>Serranus</i> sp.	„
<i>Scatophagus argus</i>	1.4
<i>Therapon jarbua</i>	„
<i>Channa striata</i>	„
<i>Mystus gulio</i>	„
<i>Wallago attu</i>	„
<i>Mastacembelus guentheri</i>	1.6
<i>Thysanophrys indicus</i>	„
<i>Clarius batrachus</i>	1.8
<i>Heteropneustes fossilis</i>	„
<i>Pseudogobius javanicus</i>	„
<i>Eleotris fusca</i>	2.2
<i>Tilapia mossambica</i>	„

250 g of finely homogenised seeds were added to one of these ponds. Later two nylon cages each of 80x80x80 cm. were made and introduced to the pond and *Anabas testudineus* and *Amblypharyngodon melettinus* which were found very sensitive to the toxicity of the seed were introduced in these cages

at the rate of 10 specimens from each species daily in the evening till no more mortality was observed. The dead specimens were removed at an interval of six h. Fresh specimens were introduced after removing the previous ones both dead and alive. This experiment was repeated in the other pond and the average values are presented in Table 2. A similar test was conducted to study the stability of toxicity in tidal water ponds (Test 3B). For this, the ponds selected were under strong tidal action thereby replenishing their water frequently. About 500 g of homogenised seed was applied. Specimens used in the test were *Puntius vittatus* and *Chanda gymnocephalus*. Average values of 3 trials are presented in Table 3.

Results and Discussion

Results of tests 1 and 2 show that the toxicity of *C. tiglium* seed is very effective in the eradication of most of the aquatic fauna except a few species of hard-shelled crustaceans such as prawns and crabs which require much higher concentration. Test 1 indicates that the lethal concentrations of the seed vary considerably for different species of fishes. While a concentration of 1 p.p.m. is found lethal to most of the aquatic fauna, 2 p.p.m. is required for their complete eradication. Identical results have been obtained from field studies as observed in test 2. While the toxicity of homogenised seed at the rate of 5 kg/ha was sufficient to kill a majority of organisms, a concentration around 10 kg/ha was essential for the eradication of certain hardy species except for a few species of crustacea.

Results of tests 3A and 3B suggest that the toxicity of homogenised *C. tiglium* seed in natural ponds is of short duration lasting for about 5–8 days in still water ponds of varying ecological conditions and only for about 1–3 days in ponds with replenished water by tidal action.

The toxicity of the seed is mainly due to two toxic proteins, croton globulin and croton albumin and a lesser extend to some lipid components including some fatty acids (Thorpe & Whitely, 1939).

Organisms exposed to the solution of *C. tiglium* seed show restlessness indicative of

Table 2. *Stability in the toxicity of homogenised Croton tiglium seed in still water pond*

Water spread area ha	Average depth m	Quantity of seed applied g	Temp. range °C	Salinity ‰	Species of organisms tested	Test period in days									
						1	2	3	4	5	6	7	8	9	10
0.01	0.5	240	29-31	0	<i>Anabas testudineus</i> % mortality	100	100	100	100	100	40	20	0	0	0
					<i>Amblypharyngodon meletinus</i> % mortality	100	100	100	100	100	50	30	0	0	0

Table 3. *Stability in the toxicity of homogenised Croton tiglium seed in a tidal pond with frequently replenished water*

Water spread area ha	Average depth m	Quantity of seed applied g	Temp. range °C	Salinity ‰	Species of organisms tested	Test period in days					
						0	1	2	3	4	5
0.01	0.7	500	29.5-32	18	<i>Chanda gymnocephalus</i> % mortality	100	100	55	0	0	0
					<i>Puntius vittatus</i> % mortality	100	100	40	0	0	0

stress and wriggle vigorously for about an hour. Gradually they become sluggish and passive. Meanwhile the membranes of the mouth, gills and anal aperture become blood red with blisters and may even rupture. The toxic resin of the seed is responsible for the blistering of the skin (Thorpe & Whitely, 1939). Organisms susceptible to the toxicity of the seed may die within 30 min to 24 h depending on their natural resistance.

The most widely used indigenous aquatic pest and predator toxicant in India is mohua oil cake. It has to be used in large quantities (200 p.p.m.) and is not easily available in many places. On the contrary *C. tiglium* seed is required only in small quantities and is easily available all over the country (CSIR, 1950). It has wide scope as an aquatic pest and predator eradicator in fish farms since it is effective, indigenously available, cheap, easy to use and with short term toxicity.

However, the one and only drawback observed is its inadequacy in the eradication of some of the hard shelled crustaceans. Usually in the brackishwater habitats prawns and crabs are the major representatives of crustacean macrofauna of which only crabs become problematic to culture fishery. *Scylla serrata* is the common predatory species in most of the brackish water habitats. In clear water they can be easily captured with nets, traps or speared. This method of eradication is, therefore, recommended for the eradication of pests during the preparation of ponds for stocking fry and fingerlings and general cultural operations.

One of us (OD) is thankful to the Kerala State Science and Technology Committee for the award of a Post-Doctoral Research Fellowship during the tenure of which this work has been carried out.

References

- CSIR, New Delhi (1950) *The Wealth of India - A Dictionary of Indian Raw Materials and Industrial Products*. Raw materials, vol. II
- Hall, C. B. (1949) *Ponds and Fish Culture*. Faber & Faber, London, 244
- Hickling, C. F. (1971) *Fish Culture*, Faber & Faber, London, 317
- Hora, S. L. & Pillay, T. V. R. (1962) *Handbook on Fish Culture in the Indo-Pacific Region*. FAO Fish. Biol. Tech. Pap. 14, 204
- Konar, S. K. (1964) *Indian J. Fish.* 11, 689
- Pillai, T. G. (1962) *Fish Farming Methods in the Philippines, Indonesia and Hong Kong*. FAO Fish. Biol. Tech. Pap. 18, 68
- Rabanal, H. R. & Hosillos, L. V. (1957) *Indo-Pacif. Fish. Coun. Tech. Pap.* IPFC/C57/Tech/20, 23 (mimeo)
- Tang, Y. (1967) *Curr. Aff. Bull. Indo-Pacif. Fish. Coun.* 49, 14
- Thorpe, J. F. & Whitely, M. A. (1939) *Thorpes' Dictionary of Applied Chemistry* 4th edn. vol. 3, p. 434, Longmans, Green & Co., London