

## BIOPHARMACOLOGICAL EFFECTS OF EXTRACTS OF SOME COMMONLY AVAILABLE INDIAN PLANTS ON *CHANNA STRIATA*

Binukumari, S.\* and J. Vasanthi

Department of Zoology, Kongunadu Arts & Science College, Coimbatore.

\* E-mail: [binu.kumari@rediffmail.com](mailto:binu.kumari@rediffmail.com)

### ABSTRACT

Six commonly available Indian plants extracts on *Channa striata* indicate that acetylcholine synthesis and acetylcholinesterase inhibition were observed in the heart, brain, muscle and liver tissues. The possibility of using the toxic substances as fish bait is discussed.

**Key words :** Acetylcholine, Acetylcholinesterase, *Channa striata*.

### 1. INTRODUCTION

Many Indian plants have been increasingly tested for a wide variety of biological activities including antifertility, anticancer, chemotherapeutic and pharmacological activities (Agarwal and Rangari. 2003; Bol Kent *et al.*, 2004). However, most of these studies were done only on mammals.

Though various plant extract are used as arrow poisons and fish baits, no study to date has evaluated the biopharmacological properties of these plant extracts on fresh water food fishes. In order to identify a substance which can be easily obtained and readily used for fish hatching purposes. We have evaluated to pharmacological effects of six commonly available poisonous plants in our area.

### 2. MATERIALS AND METHODS

#### 2.1. Collection of Plants

The following plants are collected and tested.

Plant	Family	Parts Used
<i>Datura metel</i>	Solanaceae	Seeds
<i>Gloriosa superb</i>	Liliaceae	Roots
<i>Vinca rosea</i>	Apocynaceae	Leaves
<i>Calotropis gigantean</i>	Asclepiadaceae	Leaves
<i>Antiarachis toxicaria</i>	Moraceae	Leaves
<i>Parthenium hysterophorus</i>	Compositae	Leaves

#### 2.2. Procurement of fingerlings

These plants were screened for pharmacological effects in the commonly available and economically important freshwater food fish *Channa Striata*. The fishes (10-25g) were procured from local freshwater sources and held in laboratory in large plastic tanks (02: 6-7 mg/l; pH 6.7-6.9; fish density 8-15 g/l water) for 15 days before using in the experiments. Fishes were subjected to 50%

ethanolic extracts for 30 days. The level of plant extract was kept constant by changing the water everyday and adding the requisite amount of plant extract stock solution. They were fed daily prior to change of water to prevent ingestion of plant extract through food. A control group exposed to ethanol alone was also maintained. At the end of 30 day period, the fish were killed by decapitation and the tissues rapidly excised. The tissues were raised, blotted and homogenized in a motor driven all glass homogenizer with two volumes of chilled saline (0.7% NaCl). Homogenates were centrifuged at 10,000 g for 15 min. The supernatant fraction were diluted with ten volumes of chilled saline and used as the enzyme source.

#### 2.3. Determination of Biopharmacological activity

The activities of acetylcholinesterase were determined according to the methods of Bock endahl and Ammon (1955) using 4.5 x 10<sup>-2</sup> M acetylcholine as substrate. The acetylcholine content was determined after Metcalf (1951) and proteins by the method of Lowry *et al.* (1951). The different sets of data were examined for significant difference (P<0.05) by Wilcoxon's two-sample test (Hodges and Lehman, 1970).

### 3. RESULTS AND DISCUSSION

#### 3.1. Inhibition of Biopharmacological activity

The results are presented in the Table 1 and Table 2. From the results it is clear that acetylcholine in accumulated significantly and acetylcholinesterase is inhibited in the heart, brain, muscle and liver tissues of *C. striata*. Maximum inhibition is recorded for Parthenium and Datura. The accumulation of acetylcholine indicate the blockage of nerve impulse transmission. The rapid depletion of acetylcholinesterase again show the disruption of neuromuscular transmission.

### 3.2. Types of toxins in plants

All the six plants extracts contain potent toxic substances and inhibit the functioning of the nervous system. According to Viswanathan and Joshi (1983), some of the toxic substances present in the tested plants are

Datura	-	tropane alkaloids- atropine, hyoscyamine and scopolamine
Gloriosa	-	Colchicine (alkaloid)
Vinca	-	75 alkaloids (Taylor and Fransworth, 1975)
Calotropis	-	Steroidal glycoside-Calotropin
Antiaris	-	glycoside $\alpha$ - antiarin
Parthenium	-	sesquiterpene lactone parthenin

Plant derived substances are mainly evaluated for anti-inflammatory and antifertility activities in mammals (Agarwal and Rangari, 2003; Gupta and Sharma, 2003). However, recently a potent cardiotoxic factor was isolated from the skin of *C. Striata* (Karmakar *et al.*, 2002). These bioactive compounds inhibit respiratory enzymes (Al-Hassan *et al.*, 1985). The nanotoxic effect and isolation of these compounds to use as fish bait is hitherto unnoticed in many plants. Pond, river and lake fishing require cheap and safe fish baits. Synthetic pesticides and insecticides not only poison the fishes baited but also pollute the aquatic environment. Bioactive compounds are safe and environmental pollution is almost nil (Bol Kent *et al.*, 2004). All the six plants tested are available throughout India and in many areas they are considered to be dangerous weeds for agriculture and livestock grazing.

### 4. CONCLUSION

The toxic substances present in the six plants inhibit the neuromuscular transmission. These toxic substances accumulate in the fish metabolism and cause neural problems to the people those who consume it. Therefore, proper arrangements have to be taken by the government and volunteers to eradicate the unwanted weeds from the crops and agriculture field.

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**Table 1. Effects of Plant Extracts on the Acetylcholinesterase and Acetylcholine Activities in the Heart and Brain of *C.Striata***

	Heart				Brain			
	AchE		Ach		AchE		Ach	
	Control	Exp	Control	Exp	Control	Exp	Control	Exp
Datena	37.41±2.88	24.50±3.11	24.51±2.76	68.90±3.81	76.12±5.01	21.41±4.80	28.63±3.40	79.52±4.06
		-34.51		-181.11		-71.19		+177.75
Gloriosa	37.41±2.88	27.50±2.61	24.51±2.76	65.19±3.06	76.12±5.01	23.82±2.19	28.63±3.40	66.41±3.00
		-26.49		+165.97		-68.71		+131.96
Vinca	37.41±2.88	22.41±0.89	24.51±2.76	70.65±4.16	76.12±5.01	20.43±3.01	28.63±3.40	82.40±3.93
		-29.40		+157.77		-72.53		+135.91
Calotropis	37.41±2.88	22.41±0.89	24.51±2.76	70.65±4.16	76.12±5.01	20.43±3.81	28.63±3.40	82.40±3.93
		-40.10		+188.25		+70.16		+181.81
Antiarcis	37.41±2.88	24.67±0.89	24.51±2.76	67.51±3.08	76.12±5.01	22.41±3.01	28.63±3.40	78.43±4.00
		-34.06		+175.44		-70.56		+173.43
Parthenium	37.41±2.88	20.61±2.90	24.51±2.76	72.36±4.08	76.12±5.01	20.00±1.90	28.63±3.40	82.19±42.1
		-44.19		+195.23		-73.73		+187.08

Value expressed as mean ± SD of 6 observations are significant p<0.001

**Table 2. Effects of Plant Extracts on the Acetylcholinesterase and Acetylcholine Activities in the Muscle and Liver of *C.Striata***

	Muscle				Liver			
	AchE		Ach		AchE		Ach	
	Control	Exp	Control	Exp	Control	Exp	Control	Exp
Datena	36.41±2.80	19.30±3.01	21.56±2.76	67.51±3.00	26.06±2.10	14.50±1.99	13.61±1.04	25.18±1.77
		-46.99		+213.13		-44.36		-85.01
Gloriosa	36.41±2.80	21.18±1.99	21.56±2.76	66.51±2.66	26.06±2.10	16.41±2.00	13.61±1.04	26.02±1.94
		-41.83		+208.49		-377.03		+91.1€
Vinca	36.41±2.80	20.51±1.97	21.56±2.76	68.06±3.04	26.06±2.10	16.90±2.71	13.61±1.04	23.40±2.00
		-39.14		+161.60		-41.75		+64.5€
Calotropis	36.41±2.80	20.51±1.97	21.56±2.76	68.06±3.04	26.06±2.10	16.09±2.71	13.61±1.04	23.40±2.00
		-43.55		+215.68		-35.15		+71.9€
Antiarcis	36.41±2.80	21.16±2.06	21.56±2.76	66.02±3.81	26.06±2.10	14.81±1.72	13.61±1.04	24.01±2.01
		-41.88		+206.21		-43.17		+76.41
Parthenium	36.41±2.80	16.41±2.00	21.56±2.76	68.19±3.83	26.06±2.10	13.60±0.99	13.61±1.04	26.14±2.01
		-44.69		+216.28		-47.81		+92.0€

Value expressed as mean ± SD of 6 observations are significant p<0.001