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Behavioral study of female crab *Brytelphusa guerini* under acute stress of dimethoate.

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Abstract

Behaviour includes all those process by which an animal senses the external world and internal state of its body, and responds to changes which it perceives. Many of such processes will take place inside the nervous system and may not be directly observed but reflected through the behaviour of the animal. When an organism is exposed to any toxic agent, some changes occur in the behaviour which can be observed externally. These behavioral changes may be co-related to they changes occurring in the nervous system, as different behavioural responses are sub-served wholly or partly be the different neural circuits which are distributed in the nervous system. Earlier reports revealed that there is a strong correlation between physiological activities, metabolic changes and behaviour of animals. The paper deals with toxic effect of dimethoate on fresh water female crab *Barytelphusa guerini* and its behavioural study. The experimental animal shows various activities which is recorded and discussed.

Keywords: Behavioral study, *Barytelphusa guerini*, Dimethoate

INTRODUCTION

Some behavior workers refuse to them and concentrate entirely on directly observable aspects of use them and concentrate entirely on directly observable aspects behaviour. However most of the workers who have worked with animal under natural conditions recognize the necessity to invoke variables in behaviour.

Behaviour can be defined as the sum of responses of an organism to internal and external stimuli. According to [10,12] the behavior of an organism represents the functional integrity of the central nervous system, but the activity of central nervous system can not be determined independent of behavioural analysis.

When an organism is exposed to any toxic agent, some changes occur in the behaviour which can be observed externally. These behavioural changes may be co-related to they changes occurring in the nervous system, as different behavioural responses are sub-served wholly or partly be the different neural circuits which are distributed in the nervous system. Earlier reports revealed that there is a strong correlation between physiological activities, metabolic changes and behaviour of animals [20, 16]. Many reports also strongly support the neurological changes induced behavioural alternations. [25,9]. All toxic effects of organo-phosphorous compounds on mammals have been reported to induce behavioural effects [1], immuno toxic effects visual disturbances [11] and paralysis [5].

Behavior includes all those process by which an animal senses the external world and internal state of its body, and responds to changes which it perceives. Many of such processes will take place inside the nervous system and may not be directly observed but reflected through the behavior of the animal.

MATERIAL AND METHODS

Both control and experimental crab were placed in glass aquarium. The movement of the crabs in the aquarium feeding response, response to close human presence and threat and other relevant behavioural changes has been monitored. The crab *Barytelphusa guerini* was selected for the present study. *Barytelphusa gurini*, a freshwater female crab was collected from the paddy field. They were collected from the natural habitat. Healthy female crabs weighing between 30 – 45 gm were selected for experimentation. The selected animals were divided into different groups each containing 10 animals.

The animals were kept in the glass aquarium. The volume of water was adjusted such that the animals were just submerged under the water. The glass aquarium was cleaned with 1% $KMNO_4$, before use. The crabs were fed with small pieces of goat muscles, frog muscles, earth worm, to unable the animals from effect of starvation. In the laboratory, the animals were acclimatized to laboratory conditions for three days prior to experimentation.

The temperature was 25°C to 32°C; healthy female crabs were selected for present work to avoid the effect of sex and size.

In toxicity bioassay test, group of test animals are exposed to wide range of pesticide and are closely observed for signs of intoxication and mortality. Crabs were divided into several batches, each batches containing 10 crabs. The crabs were exposed separately to different concentration of endosulfan and dimethoate

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and mortality was recorded after 24hrs, 48hrs, 72 and 96 hours.

RESULT

The female crabs *Barytelphusa guerini* showed very quick and notable response against dimethoate. Crab exposed to lethal concentration of dimethoate settled at the bottom of the trough. The locomotary activity was disturbed water media in the first day itself. Crab occupied larger area than to that of control group. Irregular, erratic and darting movements with imbalanced activity and attempt to jump out of the toxic medium observed.

Crab in non-toxic media showed full covering of the trough during the first two days. No other notable behaviour was observed in control. The detail observations are given in Table

Symptoms Observed

Behavioural changes were noted time to time in different groups of animals exposed to pesticide Dimethoate pollutant. The acute toxicity has been studied with dimethoate with various concentrations.

Study of Behavioural Acute Toxicity with Dimethoate

As shown in Table indicates acute toxicity data with different concentration of dimethoate solution to which the animals *Barytelphusa guerini*, a freshwater female crab were exposed. Observed behavioural symptoms from eleven responses of groups were noted.

Response Group No.1 (Control):

In this group freshwater female crab *Barytelphusa guerini* were exposed in regular tap water which serve as control. All the animals were showed normal activity within 96 hours.

Response Group No.2 and No.3:

Symptoms exhibited by animals in these groups were recorded, after one hour exposure time, the animals became active, increase in respiratory metabolism and active movement of chelate legs for biting. Mortality was seen in group No.2, 10% in group No.2, and 20% within 96 hours.

Response Group No.4 and No.5:

Hyper excitability increase in rate of oxygen consumption which is followed by exclusion of air bubbles through gills and increase in mucus secretion is seen around the mouth area. Mortality were recorded in these groups was 30% within 96 hours.

Response Group No.6 and No.7:

As the exposed animals became with slight noise movement sheart but after long exposure time upto 96 hours and increase in concentration of media animals showed progressive decrease in respiration and upward movement of their chelate legs. Animals became sluggish and violent and there was change as colour of ventral side that become dark instead of yellowish all these symptoms were observed within some hour. This group shows 50% and 60% mortality. LC_{50} was in between in group no.6 and no.7.

Response Group No.8 to No.11:

Symptoms recorded in these groups were similar to the symptoms observed in group no.7. It shows hyper excitability loss of locomotion and decrease in exhalation. The mortality recorded in these groups was 70%, 80%, 90% and 100% respectively within 96 hours

Observation made during lethal concentration exposure of freshwater female crab *Barytelphusa guerini*

Observations	Dimethoate
Response against pollutant	In Dimethoate crabs show excitated activity. These are move to corners of container & try to avoid toxicant by climbing on one another.
Activity of mouth parts	Mouth parts showed movement continuous washing chelae within 24h, but after 24h mouth deeped in water media. Bubbles out the air.
Activity of eye lead	Eyes always in fast movement. Within 24h their movement fast as compare to 48h & 72h. There eyes easy open by striking any disturbance.
Activity of chelate legs	Chelate activity in dimethoate same in Endosulfan these are very loosely at 96h.
Position of crabs in aquarium	When crabs exposed in dimethoate, first position fast movement through out aquarium. Second position they form clamping grop. They died at the point where they stay.
Locomotary Activity	Moved constantly and tried to sit at edges with back legs lifted on sides.
Balance equilibrium and coordination	High concentration crabs lost balance collapsed and died in down position. After 24h show loss of balance and un-coordination action.
Attacking excitement	In dimethoate crabs attacking excitement very fast within 48h. After 72h excitement low. At 96h crabs show unbalanced attacking.
Offence and defense	Offensive and attacked approaching object, high concentration crabs in 72 hrs. Sluggish but offensive.
Food & Feeding	In dimethoate crabs take fast food upto 48 hrs. Feeding slowly after 72 hrs.

Discussion

In the present study a progressive deteriorated feeding response was observed in the crab *Barytelphusa guerini* during endosulfan intoxication. [2] Reported ineffective feeding and un-coordinated movements in field crab *O. senex senex* expoed to sumition. This reflects the effects of Ach accumulation at nerve endings, thus disrupting the synaptic transmission of nerve impulses from one neuron to another. A decreased intake of food in the fish, *C. carpio* to methyl parathion intoxication was reported by [15] and in the field mouse, *Mus booduga* to BHC treatment. Dark fluid exuded out from the mouth of the crab to endosulfan intoxication. Dark

frothing fluid exuding from the mouth of the crab, *O. senex senex* was observed during sumithion intoxication [2]. Sumithion exposure causes morphological changes, such as sweeling of clitellum region in earthworm, *L. mauritii* [4], mucous secretion oozing out from the foot, decreased locomotion and feeding in the freshwater snail *P. globosa* [18].

The organophosphorus insecticides act as nerve poisons by blocking synaptic transmission in cholinergic part of the nervous system [6, 14]. They apparently inhibit the action in vivo of the enzymes Ach E [3]. Murphy [14] reported that accumulation of acetylcholine in the central nervous system is believed to be responsible for all the behavioural changes that occurred due to organophosphate poisoning.

Disorders in the central nervous system could affect the locomotors ability of the crab. During the initial phases of low dose of phosalone intoxication, rats exhibited restlessness, uncoordinated movements, urination, salivation and profuse sweating. More ever tremors, ataxia, twitching of muscles and hind leg paralysis were also noted [7].

The high excitability shown by vigorous movement of chelae cleaning movements, movements of walking legs and loss of equilibrium and co-ordination are in accordance with previous reports in different fishes as organophosphate and organochlorine pesticide exposed fish [22] and crustaceans as organophosphate exposed prawn, *Macrobranchium lamerrii* [21]. Organochlorine exposed prawns, M. Kistnensis [17] phosphomidon exposed shrimps, *M. malcolmsonii* [19].Heavy metal exposed *Paratelphusa jacquemontii* [24], *and Barytelphusa guerini* [13, 8,23].

Behavioral changes observed in the present study in the crab can be taken as useful parameters in formulating safe concentration levels of endosulfan and dimethoate to crab to ensure proper protection of crab and other aquatic recourses.

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REFERENCES

[1] Annau, Z. 1992. Neurobehavioral effects of organophosphorus compounds. In: Organophosphates: Chemistry, Fate and Effects. Eds. J.E. Chambers and P.E. Levi, Academic Press, New York, pp.419-432.

[2] Bhagyalakshmi, A., Sreenivasulu Reddy, P. and Ramamurthi, R. 1984. Subacute stress induced by sumithion on certain biochemical parameters in *Oziotelphusa senex senex* the freshwater field crab. *Toxicol. Lett.* 21: 127-134.

[3] Cremlyn, R. 1978. Pesticides, preparation and mode of action. John Wiley, USA. In: Pesticides in the Indian Environment, B.D. Nag Chaudhuri, Interprint Publication, pp.46-47.

[4] Dayananda Reddy, R. 1980. Effect of organophosphorous pesticide, Sumithion on some aspects of physiology in the earthwarm, *Lampito mauritii* (Kinberg), M.Phil. Dissertation, S. V. University, Tirupati, India

[5] Gupta, A., Gupta, A. and Shukla, G.S. 1995. Development of brain free radical scavenging system and lipid peroxidation under the influence of gestational and lactational cadmium exposure. *Human and Experimental Toxicology.* 14(5): 428-433.

[6] Health, D.F. 1961. Organophosphorus Poisons. Pregmon Press, New York.

[7] Janardan Reddy, S. 1988. Effect of phosalone toxicity on respiratory functions of rat blood. Ph.D. Thesis, S.V. University, Tirupati, India.

[8] Khan, A.K., R.T. Patel. 2000. Effect of mercuric chloride on freshwater crab *Barytelphusa guerini*. Ph.D. Thesis submitted to Marathwada University, Aurangabad.

[9] Krishna Reddy, P.V. 1996. Impact of cadmium chloride on the neurotransmitter system in the brain of rat. Ph.D. Thesis, S.V. University, Tirupati, India.

[10] Mello, N.K. (1975). *Federation Proc.* 34(9): 1832-1834.

[11] Misra, U.K., Nag, D., Misra, N.K., Mehra, M.K. and Ray, P.K. 1985. Some observation on the macula of pesticide workers. *Hum. Toxicol.* 4: 135-145.

[12] Mitchell, C.L., Tilson, H.A. and Cabage, P.A. 1982. In: Nervous system toxicology. Ed. C. Mitchell, Ravan Press, New York, pp.229-236.

[13] More A.D. 1993. *Const. Inf. Explor. Mer.* 179: 154-161.

[14] Murphy, S.D. 1980. Pesticides. In: Doull, J. Klassen, C.D. and Andur, M.D. (Eds.) Toxicology the Basic Science of Poisons. McMillian Publishing Company Inc., New York, p.357.

[15] Nagarathanamma, R. 1982. Effect of organophosphate pesticide on the physiology of freshwater teleost *Cyprinus carpio*. Ph.D. Thesis, S.V. University, Tirupati, India.

[16] Pavan Kumar, T. 1976. Studies on locomotors and physiological rhythms in the slug; Lacvicaulis alte, Ph.D. Thesis, S.V. University, Tirupati, India.

[17] Pawar, K.R. and Meena Katdhare. 1983. Acute toxicity of sumithion, BHC, Furadon to freshwater prawns. *Geobios*. 10: 136-137.

[18] Ramana Rao and Ramamurthi. 1978. Increase in protein content of food and hepatopancreas of *Pila globosa* exposed to sumithion. *Indian. J. Her.* 11: 10.

[19] Reddy, S., Sirnivasula, B., Narsimha Murthy and Ramana Rao K.V. 1985. Toxicity of phasphomidon to palaemonid shrimp, *Macrobranchium malcomsonii. Environ. & Ecol.* 3: 278-279.

[20] Rice, P.R. and Armitage, K.B. 1974. The effect of photoperiod on oxygen consumption of the crayfish, *Orconectesnais*, *Comp. Biochem. Physiol.* 47(A): 261-270.

[21] Sarojini, R. and Gynanath, G. 1983. Behavoural disfunctions of the freshwater prawns. *Macrobranchium lamerrii* after exposure to pesticide. *Uttar Pradesh J. Zool.* 3: 145-148.

[22] Singh, N.N. and Shrivastava, A.K. 1982. Toxicity of a mixture of aldrin and other organophosphorus, organochlorine and carbonate pesticides to the Indian Cat Fish. *Heteropeneustes fossilis. Comp. Physio. Ecol.* 7: 115-118.

[23] Tamloorkar, H.L. 2002. Ph.D. Thesis, S.R.T.M. University, Nanded (M.S.), India.

[24] Thankar, S.S. 1985. Effect of some pollutants on edible crab, *Paratelphusa jacquemontii*, Ph.D. Thesis, Amaravati University, Amaravati (M.S.), India.

[25] Venkatramaiah, S. 1991. Studies on the effects of phosalone on certain physiological processes of *Tilapia mossambica* (Peters). Ph.D. Thesis, S.V. University, Tirupati, India.