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Two Pesticides Endosulfan and Dimethoate Effect on Lethal Concentration Mortality Rate (Lc 50) On Female Crab Barytelphusa Guerini

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Abstract:

The chlorinated hydrocarbons are basically organic compounds that have been chlorinated with several atoms of chlorine per molecule. These insecticides have very low solubility in water but are readily soluble in fats (Abbot *et al.,* 1969). These compounds are chemically stable and show considerable persistence upon introduction into physical environment. Since these compounds are stable and persistent, they are referred to as "hard pesticides" .Some examples of these pesticides are DDT, Lindane, Heptachlor, Mirex, Chlordane, Aldrin, Methoxychlor, Dieldrin, endosulfan, Toxaphene etc. These compounds exhibit biological magnification in the food chain (Macek, 1969).

One of the most important classes of the present day synthetic pesticides is the organophosphorus insecticide of which more than 100 are widely used as agents to combat plant pests and ectoparasites and in part to combat endoparasites of domestic animals. Some of the important advantages of organophosphate compound, as the preferred insecticides of modem era, are the wide spectrum of action on plant pests, high insecticide activity, low persistence, rapid metabolism and poor accumulation in the body of animals.

The organophosphorus compounds are more toxic to mammals than the organochlorine compounds. They have the important advantage of being relatively not so persistent either in the physiological environment or with the organism due to their biodegradability. The paper comparatively observe the effect of two pesticides Endosulfan and Dimethoate on mortality rate of Female crab Barytelphusa guerini

Keywords: Endosulfan and Dimethoate, Lethal Concentration, Female Crab, *Barytelphusa guerini*

Introduction:

The birth of pesticide era in the late 1940's was hailed as major breakthrough for mankind. The chemicals provide potent in the war against vectors of disease and pests of crops, forests and rangeland. These ling lasting poisons which belong to a group of chemicals called organochlorine compounds were successful weapons against mosquitoes, grasshoppers, weevils and other harmful insects. It was beloved that organochlorines would stop pests in their tracks, eradicating diseases and saving the products of forestry and agriculture for human consumption. This led to a progressive increase in the use of the compounds.

The environment has created many useful chemicals. Evolution of chemical insecticides essentially being with readily available materials such as arsenicals, petroleum oils and botanical insecticides that appeared for public age were Di-nitro compounds and Thiocyanates. Perhaps the most significant discovery leading to the proliferation of new synthetic insecticides was that of DDT. As the use of pesticides reached massive proportion, a darker side of these toxic chemicals revealed itself. Carried by natural forces such as wind, rain and the flow of rivers and ocean currents, residues of organochlorines being to appear everywhere on the globe, from tropical forests to Antarctic snows. Wrose still, the slowly decomposing chemicals were talking their toll among many non–target fish and wildlife species. It becomes clear from the residue found in the bodies of dead or dying birds, that pesticides were directly responsible for their deaths.

The acute toxicity tests are generally used to determine the concentration of a toxicant that produces a specific adverse effect on a specified percentage of test organisms in a given amount of time. Because death is normally easily detected and obviously important adverse effect, the most, common acute toxicity test is acute lethality test. Experimentally, effect on 50% of group of test organisms is the most reproducible and easily determined measure of toxicity and 96h is often a convenient and useful exposure duration.

Non–target organisms respond differently to the presence, in the environment, of different chemicals pesticides. Accordingly different investigators adopted different methods to access the lethality of pesticides. However, the most frequently determined indices of acute toxicity testing are the median lethal dose (LD_{50}) and median lethal concentration (LC_{50}). It is customary to represent the lethality of a pesticide to a test species in terms of mortality and time. Thus most investigations, in the assessment of toxicity of pesticides, involved determination of LC_{50}, the concentration which is expected to kill 50% of the test species.The

evaluation of toxic impact is the thrust of this work and hence the freshwater female crab *Barytelphusa guerini* has been selected for the toxicological studies. Present toxicology is not restricted to the study of poisons only, but it is the study of nature and mechanism of toxic effects of the substances on living organisms and other system.

Toxicology analyse lethal responses to determine toxicity for particular time intervals. The present work determined common measures of the relative toxicity of pesticide toxins, the LC_{50} value which is the single dose of toxicant that can expected to kill 50% of the test animals for any particular time period i.e. 24h. In the acute toxicity studies an organism this time period is generally extended upto 96 hours.

Material and Method:

Investigation on the toxic effects of endosulfan and dimethoate to female crab *Barytelphusa guerini* involve the determination of LC_{50} i.e. the concentration which kills 50% of the test organisms under test conditions.

In the present investigation the bioassay tests were conducted using static as suggested by Doudoroff *et al.* (1951). All investigations were conducted using technical grade endosulfan (35% EC) & dimethoate (30% EC) which is mostly used in the local area for the eradication variety of crop pests and insects. Endosulfan is not soluble in water; acetone was used as a carrier to obtain proper distribution in the test solution. Dimethoate is soluble in water dimethoate dissolves in water and used in the solution.

A stock solution was prepared in acetone and mixed in water to obtain required dilutions of endosulfan (35% EC). Dimethoate dissolved in water to prepre a stock solution.

Fresh stock solutions were used for each exposure. The medium in which the animals were maintained was replaced for every 24 hours with freshwater in order to prevent the accumulation of excretory products of animals and possible biodegradation products of pesticides.

Different concentrations were used for each concentration 10 crabs were exposed in two litres of diluted solutions, after 96 hours the number of crab killed in each concentration was recorded. The average mortality in each concentration was taken to determine the LC_{50} by graphical plots of percent mortality and probit mortality against log concentration.

Result and Observation:

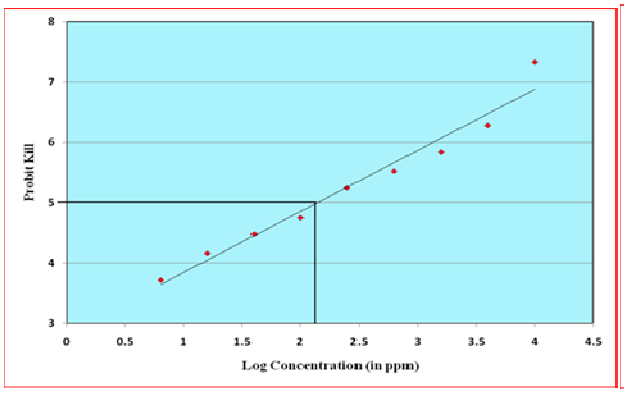
Observation:

Table: 1) LC_{50} of Endosulfan

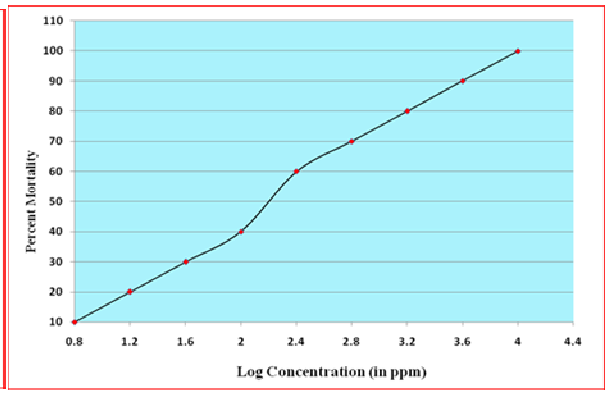
Sr. No.	No. of Animal	Conc. in ppm	Mortality				% Mortality	Probit Kill
			24h	48h	72h	96h		
1	10	Control	–	–	–	–	–	–
2	10	0.4	–	–	–	–	–	–
3	10	0.8	–	–	–	1	10	3.72
4	10	1.2	–	–	1	1	20	4.16
5	10	1.6	–	1	1	1	30	4.48
6	10	2.0	–	1	1	2	40	4.75
7	10	2.4	1	2	2	1	60	5.25
8	10	2.8	2	1	2	2	70	5.52
9	10	3.2	2	1	3	2	80	5.84
10	10	3.6	2	2	3	2	90	6.28
11	10	4.0	2	3	2	3	100	7.33

Table 2: LC_{50} of Dimethoate

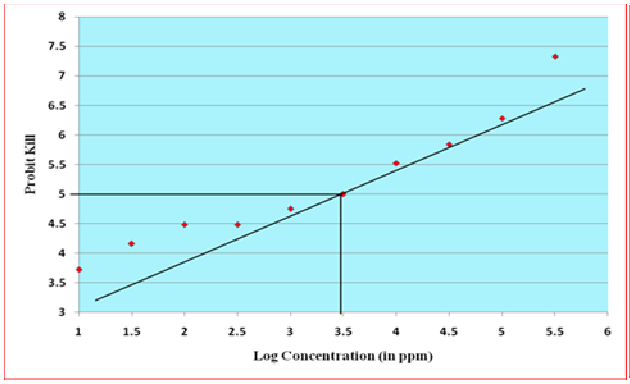
Sr. No.	No. of Animal	Conc. in ppm	Mortality				% Mortality	Probit Kill
			24h	48h	72h	96h		
1	10	Control	–	–	–	–	–	–
2	10	1.0	–	–	–	1	10	3.72
3	10	1.5	–	–	1	1	20	4.16
4	10	2.0	–	–	1	2	30	4.48
5	10	2.5	–	1	1	1	30	4.48
6	10	3.0	1	1	1	1	40	4.75
7	10	3.5	1	1	2	1	50	5.00
8	10	4.0	2	1	2	2	70	5.52
9	10	4.5	2	1	3	2	80	5.84
10	10	5.0	2	3	2	2	90	6.28
11	10	5.5	3	3	2	2	100	7.33



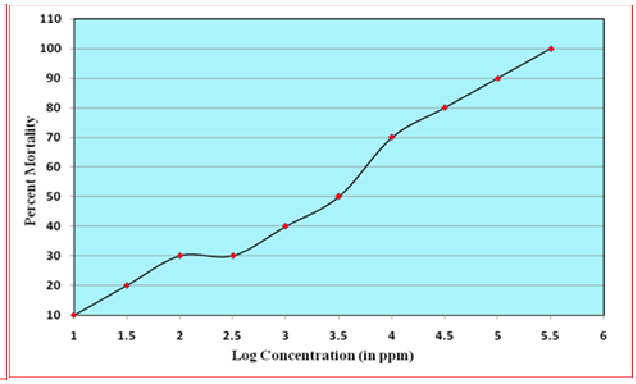
1) Linear Curve between Probit Kill of *Barytelphusa guerini* Against Concentration of Endosulfan



2) Sigmoid Curve of Percent Mortality of *Barytelphusa guerini* Against Concentration of Endosulfan



3) Linear Curve between Probit Kill of *Barytelphusa guerini* against Concentration of Dimethoate



4) Sigmoid Curve of Percent Mortality of Barytelphusa guerini against Concentration of Dimethoate

Result:

- The results of present study have given in the Table 1 & 2 and Figure (1&2) and (3&4).
- The LC_{50} values of female crab *Barytelphusa guerini* exposed to endosulfan and dimethoate, mortality increased upto 96 hours. The LC_{50} value decreased with increasing exposure period and inverse. The result showed that the mortality rate increases with increasing concentration.
- There was no mortality at 0.4 ppm for endosulfan and hundred percent moralities at 4.0 ppm concentration. In dimethoate toxic evaluation ten percent mortality occur at 1.00 ppm concentration and hundred percent mortality at 5.5 ppm.
- In case of endosulfan LC_{50} value calculated by graph log conc. against probit kill as shown in Figure (1&2) was 2.15 ppm.
- The LC_{50} value for dimethoate shown by Table 2 from 24h to 96h. Graph plotted as shown in Figure (3&4) was 3.5 ppm.

- The data tabulated in Table 3.1, 50% mortality was observed at 2.15 ppm for endosulfan, but the mortality started from 0.8 ppm. 10% mortality at 0.8 ppm, 20% mortality at 1.2 ppm, 30% mortality at 1.6 ppm, 40% mortality at 2.00 ppm, 60% mortality at 2.4 ppm, 70% mortality at 2.8 ppm, 80% morality at 3.2 ppm, 90% mortality at 3.6 ppm and 100% morality at 4.0 ppm were observed for 96h.
- The 50% animal was killed at 3.50 ppm for Dimethoate but mortality started from 1.0 ppm. 10% mortality at 1.0 ppm, 20% mortality at 1.5 ppm, 30% mortality at 2.5 ppm, 40% mortality at 3.0 ppm, 50% mortality at 3.5 ppm, 70% mortality at 4.0 ppm, 80% mortality at 4.5 ppm, 90% mortality at 5.0 ppm and 100% mortality at 5.5 ppm were observed for 96 hours.

Discussion:

The water pollutants of ecosystem are pesticides, detergents, metals, and chemicals, industrial wastes, including domestic and organic substances. Pesticides used for various purposes, ultimately drain into water by direct spraying or run off from agricultural and forest land, they directly affect the aquatic animals and reach man from various environmental contamination via the food chains. Pollutant not only affect the life cycle of aquatic organisms but may eventually became a threat to man by getting accumulated in aquatic organisms but may eventually became a threat to man by getting accumulated aquatic food chain

The percent survival rate *M. Kistenensis* decrease Shukla and Omkar (1983) studied acute toxicity of insecticide of freshwater prawn *M. Lammarrel*. Their observation shows that Aldrin is more toxic than Phosphamidon. Shukla and Pardeep (1980) reported acute toxicity of four chlorinated hydrocarbon. DDT, BHC, Aldrin and Endrin to the nymph of *B. contaminate* and their observation shows that Aldrin and Endrin were more toxic to the nymph, *B. contaminata* than either DDT or BHC (Nancy *et al.,* 1978).

Behavioural and physiological activity of crab to sublethal concentrations of endosulfan and dimethoate are not studied and the less and fragementary. There is evidence that behaviour of animals in response to pollutants may be important factor in determining the toxicity of such pesticides. Chemicals and detergents in the nature (Summerfeld and Lewis, 1967).

Bodkhe (1983) studied the toxicity of different pesticides on freshwater crab *Barytelphusa cunicularis* and observed that the order of toxicity was mercuric chloride, sevimole, Malathion, DDT, copper sulphate. These observations showed that the crustaceans also vary in their response towards pesticides. Patil*et al.,* (1991) studied on comparative evaluation of some fertiliser pollutants to the crab, *Paratelphusa*

jacquemontii and they found that the toxicity rank in order of ammonium sulphate > urea super phosphate. Amte (1993) indicate that crabs exposed to different concentrations of mercuric chloride exhibit anomalous behaviour manifestations and dose time dependent mortality rate. Selvakumar*et al.,* (1996) studied acute toxicity and they showed that based on the LC_{50} values and derived safe concentration on most of the test species appear to be safe at present level of these pollutants at the estuary and associated backwaters.

Toxicant affects normal physiological processes of all aquatic animals. It is proved by Geraldine *et al.,* (1991). He stated that various physiological disruption due to dichlorovos toxicity in *Malcobranchius malcolmsonu* pose a potendal threat to its survival. Shaleesha *et al.,* (2001) studied the median tolerance level of hexavalent chromium on *Daphnia magna* and they found that the percentage mortality increased with an increase in chromium concentration and time.

Dhanapakiam (1998) showed toxicity of mercury was more on the rate of oxygen consumption than the toxicity of cadmium but their mixture acted synergistically on the rate of oxygen consumption.

Conclusion:

The Acute toxicity tests are generally used to determine the concentration of a toxicant that produces a specific a diverse effect on a specified percentage of test organisms in a given amount of time. Because death is normally easily detected and obviously important adverse effect, the most common acute toxicity test is acute lethality test. Experimentally, effect on 50% of group of test organisms is the most reproducible & easily determined measure of toxicity and 96hour often convenient & useful exposure duration.

The evaluation of toxic impact is the thrust of this work and hence the Freshwater female crab*Barytelphusa guerini* has been selected for the toxicological studies. Present toxicology is not restrictedto the study of poisons only but it is the study of nature & mechanism of toxic effects of the substanceson living organisms and other system. The present work determined common measures of the relativeToxicity of pesticidal toxins, the LC_{50} value which is the single dose of toxicant that can expected to kill50% of the test animals for any particular time period i.e. 24h. In the Acute toxicity studies an organismthis time period is generally extended up to 96 hours

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References:

- Abbot, D.C., Goulding, R. and Tatton, J.O.G. 1969. Organochlorine pesticide residues in human fat in Great Britain. *Br. Med. J.* 3: 146-499.
- Amte, G.K. and Swant, K.B. 1993. Acute toxicity of inorganic mercury to estuarine carb. *Pollut. Res.* 12(1): 29-34.
- Bodkhe, M.K. 1983. Effect of some pesticidal effect on the physiologyof *Barytelphusa cunicularis*. Ph.D. Thesis, Marathwada University, Aurangabad (M.S.), India.
- Dhanapakiam, P.L. Manohar and V. Samporni. 1998. Median lethal effects of mercury cadmium on oxygen consumption and histopathology of common crap *Cyprinus carpio*. *J. Ecobiol*. 10(3): 193-198.
- Geraldine, P., Saravanabhar, P. and Kliamurthy, J. 1991. Effect of dichlorvos intoxication in the freshwater prawn *Macrobranchinh malcolmsonii*. *Envi. Biol.* 20(2): 141-148.
- Macek, K.J.C., Hutchinson and Cope, C.B. 1969. Effects of temperature on the susceptibility of blue gills and rainbow trout to selected pesticides. *Bull. Environ. Contam. Toxicol.* 4: 174.
- Nancy, N. Gillete, Jacqueline, L. Robertson, Robert, L. and Lyon. 1978. *J. Econ. Entmol.* 71(2): 319.
- Patil, P.S. and Nimagare, S.S., Gadkari, M.D. and Kulkarni, K.M. 1991. Comparative evolution of some fertiliser pollutants to the crab. *Ind. J. Inv. Zool. & Aqual. Biol.* 3(1): 11-14.
- Selvakumar, S., Khan, S.A. and Kumaraguru, A.K. 1996. Acute toxicity of some heavy metals pesticides and water soluble fractions of diesel oil to the larvae of some branchyurine crab, *J. Env. Biol. Muzaff.* 17(3): 221-226.
- Shaleesha, A. and V. Amalam Stanly. 2001. Studies on the median tolerance level of hexavalent chromium and oxygen consumption of *Daphnia magna. J. Aqua. Biol.* 16(2): 69.71.
- Shukla G.S. and Omkar. 1983. Acute toxicity of insecticide to a fresh prawn *Macrobranchium lamarrei* (M. Edwards). *Indian J. Environ. Hlth.* 25(1): 61-63.
- Shukla, G.S. and Pradeep K. Mishra. 1980. Toxicity of organochloroine insectides to pre-adult stages of *Brachythermis contaminata*. *Fabr. J. Environ. Res.* I. II : 17-22.
- Summerfield, R.C. and Lewis, W.M. 1967. Repulsion of green sunfish by aertain chemicals. *J. Wat. Pollu. Control Fed.* 39: 2030-2038.

