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Study of effect of malathion on mortality and deformity rate of an aquatic insect *Cybister confuses*

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Abstract- The present study reports the toxic effects of pesticide Malathion on *Cybister confuses*. The results of this research study indicate several common effects of malathion on *Cybister* like increased mortality and deformities. We conclude that the Malathion greatly affects the mortality and deformity rate of *C. confuses.* Different concentrations of Malathion showed higher rate of mortality in experimental group than the control group of *Cybister*. The net mortality rate was shown to be 31.25, 34.37, 48.79 at half sub-lethal concentration, sub-lethal concentration and LC_{50} of Malathion.

Key words: *: Cybister,* Mortality, Deformity, Malathion, Aquatic Insects

INTRODUCTION

Insects are the most visible form of life in the aquatic ecosystem, and they have a commanding position as the largest group in the animal kingdom due to their incredibly diverse habits, extensive distribution, and innumerable adaptations. Insects have overrun the land, air, and water in greater numbers than any other animal group. As a result of the large number of species, the insect group has evolved a wide range of habits and colonized a wide range of ecological niches. Around 45000 insect species are known to live in various freshwater ecosystems around the world.[1]

Cybister confuses is also called fresh water beetle. It is carnivore in nature and commonly found in pond. The species *Cybister confuses* belongs to a group of members of the genus *Cybister curtis,* 1827, which is only found in North America. The aim of present study was to investigate the mortality and deformity of this insect due to Malathion (Organophosphate pesticide). Malathion is an organo phosphate insecticide that is primarily used in agriculture and public health to manage insect infestations such as ants, aphids, fleas, fruit flies, hornets, mites, mosquitoes, moths, spiders, thrips, ticks, wasps, and weevil.[2]

Malathion kills insects by interfering with their nervous systems. A unique chemical messenger passes from one nerve to another to continue the message when healthy nerves send signals to each other. When an enzyme is released into the gap between the nerves, the nerve signal is interrupted. Malathion attaches to the enzyme, preventing it from shutting down the nerve signal. This causes the nerves to communicate with one another indefinitely. The insects can't move or breathe normally as a result of the continual nerve messages, and they perish.[3]

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MATERIALS & METHODS

Malathion: The present study was initiated to see the effect of Malathion on the mortality and rate of *Cybister confuses*. Commercially available formulations of Malathion in India were used in the present study. Three different concentrations of malathion (0.0076ppm, 0.0152ppm & 0.0217ppm) were administered to the experimental group.

Collection and maintenance of Insects: Insect, (*Cybister confuses*) beetle of the family- Dytiscidae (class- Coleoptera) were collected from different location of four ponds located in Madhepura district (Bihar). The average area of ponds is about 27,000 Sq. ft. with an average depth of five feet (about 1.5 m). Ponds temperature ranges from 11.8°C to 35.9°C. Sampling was initiated in May, 2018. Mean weight, 0.6 – 2.3g) were acclimated to laboratory conditions in glass tanks for a period of two weeks. The average size of the collected beetles was 20mm. The collected beetles were put in glass aquarium with some fingerlings, small snails and some small water plant for acclimatization.

RESULT & DISCUSSION

The following results were obtained after experiment. The table 1 shows that, in different treatment the net fatality rate was shown to be 31.25, 34.37, 48.79 at half sub lethal concentration, sub lethal concentration and LC_{50}. At the lowest chemical concentration of 0.0076 ppm, there was a minimum net mortality of 31.25 percent. Net mortality percent become 34. 37 and 48.79 at sub lethal concentration and LC_{50} respectively. At the lethal concentration -100, mortality became 100 percent.

Table 1- Effect of Malathion on the mortality of *Cybister confuses* larvae.

Concentration	Average Larvae Treated	Average Larvae pupated	Average Adult Pupated	Total Average Mortality	Mortality	Net Mortality
ppm	No.	No.	No	No ± SE	%	%
Control	20	17.8	17.8	2.2 ± 0.05	1%	-
Half Sub lethal	20	14.6	13.2	6.8 ± 0.02	34	31.25
Sub lethal	20	15.2	12.6	7.4±0.25	37	34.37
LC_{50}	20	10	5	5.0 ± 0.75	50	48.79

Graph 1- Effect of malathion on the mortality of *Cybister confuses* larvae.

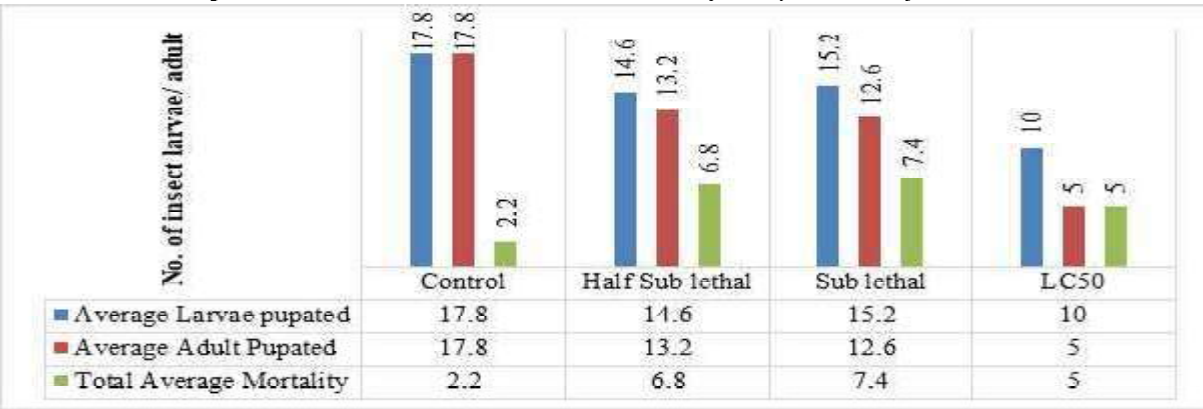
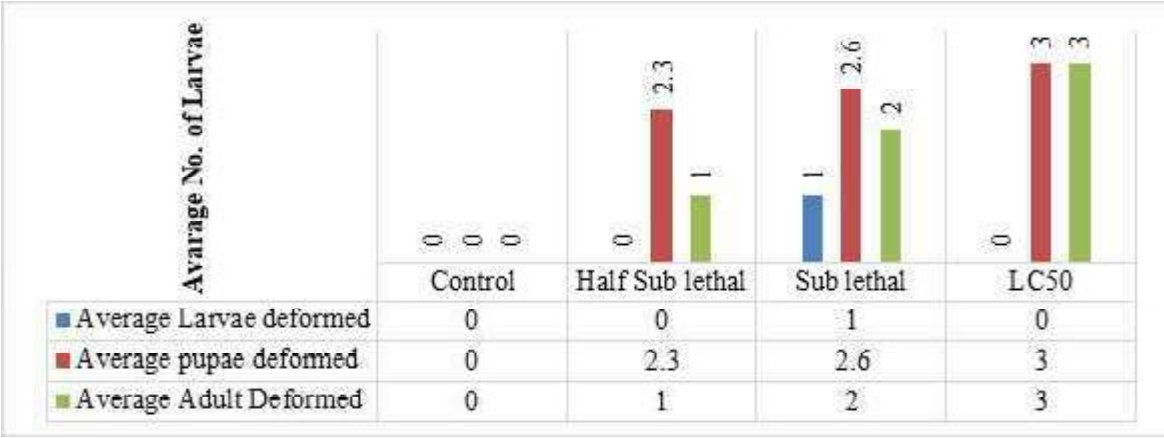


Table 2- Effect of Malathion on deformity of *Cybister confuses* insect.

Concentration	Average Larvae Treated	Average Larvae Deformed	Average Pupae Deformed	Average Adult Deformed	Total Average Deformity	Deformity	Net Deformity
ppm	No.		No.	No	No ± SE	%	%
Control	20	0	0	0	0	0	0
Half Sub lethal	20	0	2.3	1	3.3 ± 0.25	33	33
Sub lethal	20	1	2.6	2	5.6 ± 0.60	56	56
LC_{50}	20	0	3	3	6.0 ± 0.75	60	60

Graph 2- Effect of malathion on deformity of *Cybister confuses* insect.



	Control	Half Sub lethal	Sub lethal	LC50
Average Larvae deformed	0	0	1	0
Average pupae deformed	0	2.3	2.6	3
Average Adult Deformed	0	1	2	3

The data of table-2 indicates that deformities were caused by Malathion exposure. After chemical exposure deformity were observed in Larva, Adult and pupa. At 0.0217 ppm LC_{50}, a maximum total net deformity of 60 percent was found. At a concentration of 0.0076 ppm, the minimum net malformation observed was 33%. Most of the deformities were seen as larva-pupa intermediates. Swelling was also observed on the larva's body. In different treatment the net deformity rate was shown to be 33, 56, 60 at half sub lethal concentration, sub lethal concentration, LC_{50}.

The chemical had a highly toxic effect on the larva of *Cybister confuses*. At the 0.0076ppm level (Half of the sub-lethal concentration), the minimum mortality was 34 per cent and net minimum mortality was 31.25 per cent. The mortality rate increased with an increasing chemical concentration in the water level, indicating that chemical concentration is directly associated with mortality rate. Net mortality percent become 34.37 and 48.79 at sub-lethal concentration and LC_{50} respectively. Previously, several researchers conducted experiments to investigate the influence of different chemicals or insect growth inhibitors on mortality, deformities, and longevity in many types of insects. Post and Vincent (1973)[4] discovered that these compounds decrease insect growth but do not directly intoxicate larvae. However, mortality occurs during a post-treatment molt in the larval or pupal stage, at low concentrations. Post and Mulder (1974)[5] discovered that the insect growth inhibitor of malathion had insecticidal properties against *Pieris brassicae* (L.) These compounds were effective in controlling or lowering the insect population. The toxicity of Malathion in insects was studied by Krueger (1959)[6] and showed metabolism alteration due to this pesticide in insects. Ascher and Nemnly (1976)[7] investigated the "toxicity of residue on glass and the topical application of growth inhibiter to *Spodoptera littoralis* larvae (Boisd)". Malathion's effects on insect succession and the growth of carrion flies on carcasses, as well as its quantitative determination from larvae on decomposing rabbit carrion. And observed late development rate of the larvae and pupae of species *C. megacephala*.

After exposure of Malathion deformities were observed in Larva, Adult and pupa. At 0.0217 ppm LC_{50}, a maximum total net deformity of 60 percent was found. At a concentration of 0.0076 ppm, the minimum net malformation observed was 33%. Most of the deformities were seen as larva-pupa intermediates. The swelling was also observed on the larva's body. In different treatments, the net deformity rate was shown to be 33, 56, 60 at half sub-lethal concentration, sub-lethal concentration, LC_{50}. In northern California in 1982-83, the effect of malathion bait sprays applied against *Ceratitis capitata* (Wied.) on the biological control of selected non-target insects was evaluated by Ruth (1983)[8]. The sprays appeared to have reduced *Hemiberlesia lataniae* (Sign.) on olive. Two months following the final spraying, *Chromaphis juglandicola* (Kalt.) on walnut was less prevalent in the spray zone due to increased mortality and deformity of these insects. Pant and Katiyar (1983)[9] studied the Malathion effect and acetylcholine on the developing larvae of *Philosamia ricini* (Lepidoptera: Saturniidae). Malathion feeding causes acetylcholine buildup in growing *Philosamia ricini* larvae by inhibiting acetylcholinesterase activity. The insecticide also causes nutrient depletion,

weight loss, under development of silk glands, which results in reduced silk production, oviposition failure, and significant mortality and deformities in the insects.

CONCLUSION

This study has been characterized by the toxic effect of Malathion on *Cybister confuses.* Malathion greatly affects the mortality and deformity rate of *C. confuses.* Malathion greatly increased the mortality and deformities in *C. confuses.*

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