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Studies on The Experimental Control of Dragonfly Larvae Brachythemis Contaminata (Fabr.) (Anisoptera:libellalidae) with Insecticides And Bio Insecticides in the Laboratory

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KEYWORDS : Dragonfly larva, Brachythemis contaminata, Insecticides, Bio insecticides, Fish insect predators

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ABSTRACT

The studies on the control of odonata larvae Brachythemis contaminata (Fabr.) by insecticides and bioinsecticides were carried out in the laboratory. The results suggest that insecticide and bioinsecticide of different concentrations of Endosulfan, Nuvan, Malathion, Indoneem and a combination of Endosulfan+Indoneem are very effective to eradicate the larvae B. contaminata from fishponds. The present study will be useful for proper preparation of the fish nursery ponds of stocking spawn of carp for better management of fish production practices.

INTRODUCTION

Effective control of aquatic insects in nursery ponds is one of the fundamental and essential steps to ensure successful rearing of carp fish fry in them. The majority of aquatic insects either in their larval forms or in adult stages are known to prey upon and destroy large numbers of fish spawn, young fry and some very small fingerlings in nursery ponds. KONAR (1964), MEYER (1965), DIMOND (1967), and JAYASINGAM *et.al.* (1976) studied the toxic effects of certain insecticides on various aquatic insects. However, GANGULY and MITRA (1961) believe that chemical control of aquatic insects in a fish nursery is impracticable. SRIVASTAVA and KONAR (1965, 1966) revealed the efficacy of certain chemicals on the fresh water fish predators. Recently the application of bioinsecticides in the management of aquaculture ponds is gaining momentum because they are safe, effective, widely available, inexpensive and environment friendly. The aim of the present study is to know through experiments how toxic effects the different concentrations of insecticides and bio insecticides on the dragonfly larvae *B.contaminata* which is a potential predator of fish spawn and fry.

MATERIAL AND METHODS

The standard insecticides and bioinsecticides used in the present study are in their purest form with Endosulfan 35EC, Nuvan 76EC, Malathion 50EC, Indoneem 0.03EC, Endosulfan + Indoneem (35EC+0.03EC). These insecticides and bioinsecticides are the members of organochlorides (Endosulfan, Nuvan), organophosphates (Malathion) and azadirachtin (Indoneem) groups.

For the experiment, beakers with a capacity of one litre each, pipettes, a trough, an aerator and a triangular net was used. Fish fry was used as food for the larvae. Tap water was used in all the experiments. The final instar larva of dragonfly *B. contaminata* were acclimated for a period of five days to conditions similar to those under which tests were to be conducted. During this period, the larvae were fed once a day with fish fry. Small fries of Mrigal were stored as food of these larvae in a large trough with an aerator but these larvae have a remarkable ability to live without food even for several days. Dragonfly larvae of approximately same size were selected. Larvae showing symptoms of disease or deformities were discarded. After the acclimation period, the odonata larvae were transferred into bioassay vessels. A total number of 100 odonata larvae were experimented with 10 in each beaker were used.

A static bioassay procedure to suit the objective of present study was employed during the present investigation. Tests were conducted at room temperature 26±30°C. The specific period of exposure was 24 hrs. In the present study determination of the LC_{50}-24hrs was carried out. For the preliminary round, a standard concentration of insecticide of 0.1% was prepared in tap water by dipping the tip of pipette containing insecticide into water. A series of total five test concentrations in which the insects could survive for 24 hrs, were obtained from exploratory range accordingly. Now 100 larvae, with 10 in each beaker were introduced in 1000ml of these concentrations. All the five concentrations were noted, total number of larvae was noted and total mortality in each concentration in 24 hrs. was noted. The concentrations were measured in ppm and LC_{50} values with 95% confidence limits of each insecticide and bio insecticide was calculated by Probit analysis method. (SPSS ver.10.0 for windows). Feeding of larvae was completely stopped one day prior to the experiment. The insect larvae were not fed during the period of test. The complete immobility of the animal even after gently stroking with needle was taken as the criterion of death.

RESULTS

Odonata larvae prove to be a big nuisance in fish nursery as they affect adversely on the fish economy. Therefore, few insecticides and bio insecticides were used in the laboratory to control the unwanted increase of these larvae thereby increasing the growth of fishes. The insecticides selected were Endosulfan, Nuvan, Malathion, a bioinsecticide, Indoneem and a combination of insecticide and bio insecticide (Endosulfan + Indoneem).

In the present studies, certain physical reactions have been observed on introducing the larva to the concentrations of Endosulfan. The larvae swam rapidly and showed pronounced excitations. Similarly in this research, a very less dose of Endosulfan was sufficient to bring about 50% of mortality in dragonfly larva. LC_{50} value was calculated and it was observed that Endosulfan was more toxic than Nuvan and Malathion.

(Endosulfan + Indoneem) proved out to be most toxic with its LC50 value for 24 hr. at 0.14502ppm. It was followed by Endosulfan, where the LC50 for 24 hr. stood at 0.31917ppm, for Nuvan the LC50 for 24 hr. was found to be 0.50803ppm, for Malathion LC50 stood 1.27904ppm in 24 hrs. Indoneem was found to be the least toxic with LC50 value for 24 hr. at 1.35479ppm. [Table 1, Fig. 1 & 2]

DISCUSSION

Complete extermination of predatory aquatic insects like odonata larvae from a fish nursery is highly desirable for successful fish culture. The possibility of chemical control of these odonata larvae has been sufficiently indicated by the present study. PREM KUMAR and MATHAVAN (1987) have also recommended the use of pesticide in fish nurseries where a need is perceived to eliminate odonate larvae which are predators of fish fry. CORBET (1999) also stated that toxicity of insecticides to odonate larvae in decreasing order of severity, probably follows this general sequence: organochlorides; organophosphates; the botanical rotenone; carbamates; insect growth regulators; surfactants and plant oils.

In the present study also, the results of the bioassay studies on the dragonfly larvae of *B. contaminata* shows that organochlorides and organophosphates are much more toxic than bioinsecticides. Organochlorides proved to be more toxic than organophosphates and least was azadirachtin. Very low concentration of a combination of insecticide and bioisecticide (Ensosulfan + Indoneem) is quite sufficient to bring about 50% mortality in these insect larvae. Endosulfan + Indoneem ranked first in toxicity of the five insecticides and bioinsecticides tested on *B. contaminata* larva. Indoneem, a bioinsecticide was found to be least toxic.

Whereas recorded behavioural effects of insecticides on odonata larvae include jerky movements and untimely protraction of labium due to Endosulfan (CHOCKALINGAM and KRISHNAN, 1985); impairment of ability to capture prey by performing the labial strike by Durshban and Fenthion (JAYAKUMAR and MATHAVAN, 1985), rapid swimming, jerky movements, settling on the bottom, feeble leg movements, intermittent swimming to the water surface, attempts to leap out of the water due to BHC, DDT and five organophosphates including Malathion (KUMARI and NAIR, 1985) where as CHOCKALINGAM and KRISHNAN, (1985) studied the effect of toxicity of various insecticides including Endosulfan on dragonfly larvae *B. contaminata* (Fabr.) and also determined their LC_{50} values. They stated that very less amount dose of these insecticide's were sufficient to eradicate the dragonfly larvae.

SHUKLA and MISHRA (1980a) and CHOCKALINGAM and KRISHANAN (1985) have also recorded the LC_{50} values of different insecticides like Dimilin, Monocil and Endosulfan for 24 hrs. on *B. contaminata* larva. SHUKLA and MISHRA (1980a) also carried out experiments to assess LC_{50} values for the larvae of *B. contaminata* to the insecticides Furadon, Zectran and Carbaryl. SHUKLA and MISHRA (1980b) have also reported that Pyretheroid group of insecticides may cause heavy mortality of the dragonfly larva in insecticide polluted habitat.

In the present studies, the experiments conducted on *B. contaminate* larva showed that among the two selected insecticides Nuvan/Nogos and Malathion, the former i.e. Nuvan/Nogos was more toxic than Malathion. This is an example of species difference to tolerate different insecticides at different time intervals. Nuvan/Nogos provides a rapid knock-down effect on larva, which is generally applied as a spray and it is highly volatile and its fumes prove to be very toxic. Therefore in the ponds, when sprayed acts rapidly and has shorter residual effect which proves to be safe and side by side in the present studies makes Nuvan/Nogos less toxic than Endosulfan but more toxic than Malathion and Indoneem.

SAXENA and SAXENA (1986) studied the effects of different concentrations of Malathion on the dragonfly larva of *Bradinopyga geminata* and reported that the lowest mortality (11%) was at 0.2ppm and highest (86%) at 0.8ppm.

From the present study it appears that *B. contaminata* is more sensitive to Malathion as compared to the different species of Odonata larva experimented by KUMARI and NAIR (1985) and KONAR (1969). This is an example of insect species difference in their capacity to tolerate insecticides and bioinsecticides at different hours.

SAXENA and YADAV (1985) have observed that both the biological insecticides SAN402I as well as the extract of flowers of *Delonix regia* do not produce any adverse effects on the larva of dragonfly *Bradinopyga geminate* and damselfly *Ceriagrion* sp. and they stated that these larvicides neither cause mortality nor they interfere in the normal moulting process of larvae.

In the present study, a bioinsecticide Indoneem a product of Neem plant has been to observe the effect of its concentrations on larva of *B. contaminata*. Neem has been used successfully in aquaculture systems to control fish predators (DUNKEL and RICILARDS, 1998), MARTINEZ (2002) stated that aqueous extract of neem leaves and other neem based products have been extensively used in fish-farms as alternative for the control of fish parasites and fish fry predators such as dragonfly larvae. Similarly in this studies, it has been found out that the bioinsecticide Indoneem, is a useful, pollution free alternative for the control of dragonfly larva *B. contaminata* which is a voracious feeder of fish spawn and fish fry in pond ecosystem. Indoneem, though not very lethal, was found to be toxic to an extent as to kill the dragonfly larva *B. contaminata*. The toxicity as well as the oil base both play a dual role by first dissolving the poisonous content and then spreading a film of oil on the surface of the water and choke the respiratory organs there by suffocating the larva to death gradually. A combination of bioinsecticide Indoneem with insecticide Endosulfan proves to be highly toxic and fatal to the larvae of *B.contaminata* .

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Brachythemis contaminata				
Estimated LC_{50} values (24 hr.) and confidence limits (P=0.05) for different Insecticides and Bio insecticides on bioassays conducted at 26±3°C				
		(Values in ppm)		
			95% confidence limits	
S.No.	Insecticides and Bioinsecticides	LC_{50}	Lower	Upper
1	Endosulfan	0.31917	0.15313	0.68464
2	Nuvan	0.50803	0.37075	0.77839
3	Malathion	1.27904	0.78417	3.52415
4	Indoneem	1.35479	1.17206	1.54138
5	Endosulfan+Indoneem	0.14502	0.06964	0.41636

Table.1. Comparative study of the LC_{50} values of different Insecticides and Bioinsecticides for B. contaminata larva.

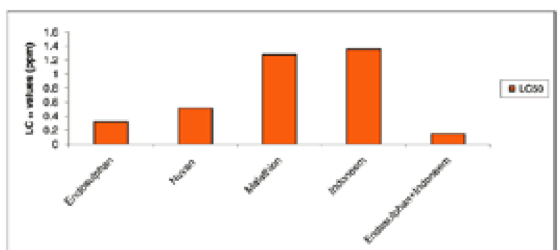

Fig. 1. Graphical representation of estimated LC_{50} values for different insecticides
and bio insecticides

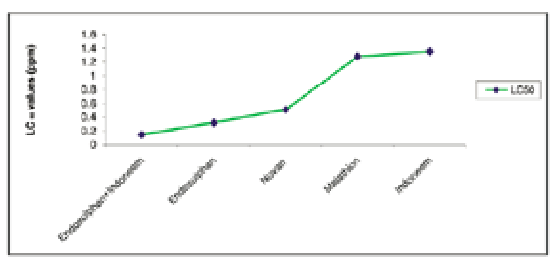

Fig.2. The intensity of toxicity of insecticides and bio insecticides in decreasing order

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