

# The impact of synthetic chemical pyrethroid deltamethrin and cypermethrin and natural biochemical Neem Oil on physico chemical parameter of fresh water and growth of fish seed in Nursery pond

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## ABSTRACT

Indian Major Carps can be breed in the rainy season this time duration insects are also developed and increase in number in fish ponds. Insects are competing with fish food and predators on fish spawn and fry in fish nurseries. Mostly chemical based insecticide used for the eradication of insects in fish nurseries but they give deleterious effects on the environment. This study was done to check out that effects of plant based insecticide on non-target organisms of fish nursery ponds and effects of Synthetic Chemical Pyrethroid Deltamethrin and Cypermethrin and Natural Biochemical Neem Oil on Physico Chemical Parameter of Fresh Water and Growth of Fish Seed in Nursery Pond. Bioassay of a natural insecticide Neem oil and synthetic Pyrethroid Deltamethrin and Cypermethrin were separately done on fresh water ponds of fish nurseries. To assess the comparative efficiency effects of Deltamethrin, Cypermethrin and Neem Oil of insect control an experiment was conducted in 4 cemented nurseries for 20 days. The insect effective dose of 0.00003 ppm deltamethrin, 0.00002 ppm cypermethrin and 0.004 ppm neem oil were used for the present study. Growth and survival of fish seeds were estimated after a culture period of 20 days and monitoring effects on phyto and zooplankton those found in water of nursery pond and Physico – chemical parameters of each set of experimental water was monitored at intervals of 5 days. This study brings the reader up to deal with comparison of Neem oil and Deltamethrin and Cypermethrin as insecticide on the Physico Chemical properties of Fresh Water and Growth of Fish Seed in Nursery Pond and provide a detailed overview of present thinking into the mode of action and effects of Neem oil as a eco- friendly insecticide in fish nurseries.

*Key words :* Indian major carp, Fish seed, Neem oil, Synthetic pyrethroid deltamethrin, Cypermethrin, Physico-chemical parameters of water.

## Introduction

Aquaculture worldwide is growing. Aquaculture's contribution to global supplies of fish, crustaceans and molluscs continues to growing and increasing from last same years. Aquaculture is growing more rapidly than all other animal food production sec-

tors. Fisheries are a sunrise sector with varied resources and potentials. Fisheries not only contribute to nutritional security but also provide employment. Generally the survival rate of fish spawn and fry during the nursery phase is very low due to the presence to large number of aquatic insect which prey heavily upon the spawn and early stages of fry.

Aquatic insects and their larvae compete for food with the young fish in nursery pond. The aquatic insect which form one of the most important faunal communities in the fresh water ecosystem. Insect usually found in the large number in ponds over the greater part of the year especially during and after rains. Indian major carp fishes breed specially in rainy season. India major carp are most important fish of aquaculture. Insect should be eradicated prior to stocking to ensure maximum survival of the spawn and good bulk production of fishes.

Traditional fish farming management system using wildy synthetic chemical insecticide for the eradication of aquatic insects in fish nurseries for getting high bulk of production. Chemical insecticide are often considered a quick, easy and inexpensive solution for controlling aquatic insects in fish nurseries. However, pesticide use comes at significant cost.

Many insecticides available in India in which synthetic pyrethroid used as a insecticides in aquaculture. Growth of fishes in aquaculture is mainly dependent on feed consumption and quality, presence of phytoplankton zooplankton and abiotic factors such as temperature, pH, dissolved oxygen, hardness, total dissolved solids (TDS), salinity, conductivity, and alkalinity such that selected insecticide should be not effected for fish food and Physico chemical properties of water fish ponds. The technique of removing aquatic insect must be economically cheap and not harmful for fish and fish seed and zooplankton. However survival rate and growth of fish seed must be excellent.

Considering this, the present study has been undertaken to the effectiveness of selected synthetic pyrethroid and natural biochemical neem oil on the Physico chemical properties of fresh water pond and growth of fish seeds in fish nurseries.

## Methods and Methodology

**Selection of site for the experiment:** - Fish farm of MPUAT, Udaipur.

**Selection of insect eradicator** – I) Synthetic Pyrethroid: I) Deltamethrin II) Cypermethrin II) Natural Biochemical: Neem Oil

**Experimental Design:** - To assess the comparative efficiency effects of Deltamethrin, Cypermethrin and Neem Oil of insect control. An experiment was conducted in 4 cemented nurseries 2×1×3.5 feet for

the total period of 20 days. The insect effective dose of 0.00003 ppm deltamethrin, 0.00002 ppm cypermethrin and 0.004 ppm neem oil were used for the present study. These doses were selected on the basis of preliminary experiment conducted using a wide range of concentrations. Doses of neem oil, deltamethrin, cypermethrin were applied in 1-3 ponds respectively and 1 pond used as non insecticide treatment (control) for the monitoring comparison effects of insecticides from each others. The effective doses of 0.00003 ppm Deltamethrin, 0.00002 ppm Cypermethrin and 0.004 ppm Neem Oil were applied 24 hrs. before the release of fish spawn in 3 ponds. After 24 hrs. of insecticide application each pond was stocked with carp spawn 5000. The spawn stocked was feed on oil cake + rice bran and their growth and survival were estimated after a culture period of 20 days and monitoring effects on phyto and zooplankton those found in water of nursery pond and Physico – chemical parameters of each set of experimental water was monitored at different time intervals. Water temperature was recorded using a Celsius thermometer, pH were measured directly using digital pH meter (HI 991001, HANNA). Conductivity Measured by digital conductometer. Dissolve Oxygen, hardness, Total alkanity, salinity were analyzed by following standard method of APHA (1986) at 5 days intervals.

## Results and Discussion

Range and mean value of selected water quality parameters in nursery pond treated with different insecticides parented in the Table A.

In the water quality parameters here temperature for control ranges from 28.5 – 31.0 °C where the mean value observed that is 30.8 °C, which is the highest value observed form neem oil, deltamethrin, cypermethrin, in neem oil system, the temperature lies about 28.3 – 31.28 °C. in case of deltamethrin the temperature range from 29.0 – 30.8 °C. For cypermethrin temperature range from 28.7 – 31.9 °C and mean value observed 30.6 °C same as of deltamethrin.

Water quality parameter pH observed for control here lies in between 7.3 – 7.8 and mean value observed as 7.6 and for neem oil here the values range from 7.3 – 7.7 and mean value is 7.6 which is same as of control and neem oil. In case of deltamethrin here pH value range from 7.4 – 7.6 and mean value determined here as 7.7 whereas for cypermethrin

**Table A13.** Range and Mean values of selected water quality parameters in nursery ponds treated with different insecticides

Treatments	Parameters							
	Temperature (°C)	pH	Dissolved Oxygen (ppm)	Hardness (ppm)	TDS (ppm)	Salinity (ppt)	Conductivity (µS/cm)	Alkalinity (ppm)
Control	28.5 - 31.0 (30.8)	7.3 - 7.8 (7.6)	6.58 - 12.00 (10.65)	113 - 139.2 (122.4)	296 - 334.6 (306)	0.3 - 0.3 (0.3)	619.50 - 632.80 (630)	107.20 - 116.50 (110)
Neem Oil	28.3 - 31.28 (30.2)	7.3 - 7.7 (7.6)	8.50 - 11.75 (10.78)	117.5 - 133.4 (120.8)	290.70 - 315.8 (302)	0.3 - 0.3 (0.3)	611.05 - 627.00 (618)	101.05 - 109.30 (106)
Deltamethrin	29.0 - 30.8 (30.6)	7.4 - 7.6 (7.7)	8.02 - 10.50 (9.31)	115.85 - 135.10 (129.2)	301 - 329.6 (323)	0.3 - 0.3 (0.3)	631.20 - 669.40 (664)	139.10 - 171.00 (166)
Cypermethrin	28.7 - 31.9 (30.6)	7.3 - 7.7 (7.8)	7.95 - 11.00 (9.59)	130.2 - 139.0 (134)	310.75 - 342.10 (335)	0.3 - 0.3 (0.3)	576.5 - 613.40 (596)	131.00 - 163.24 (156)

the value lies in between 7.3 – 7.7 and the exact value concluded here is 7.8, which is the highest mean value of pH from control, neem oil, deltamethrin and cypermethrin.

Dissolved oxygen water parameter value here for control range from 6.58 – 12.00 ppm and mean value recorded as 10.65 ppm. for neem oil, here from all of the three system control, deltamethrin, cypermethrin. In case of deltamethrin value range from 8.02 – 10.50 ppm and mean value recorded as 9.31 ppm. For cypermethrin, the dissolved oxygen value range from 7.95 -11.00 ppm and mean value recorded here is 9.59 ppm.

The water parameter hardness for control medium here range from 113 – 139.2 ppm and mean value recorded as 122.4 where for neem oil the value range from 117.5 – 133.4 ppm and mean value recorded as 121.8 ppm. for deltamethrin value observed here lies in between 115.85 – 135.10 ppm and mean value recorded here is 129.2 ppm whereas for cypermethrin the values here recorded in between 130.2 – 139.0 ppm and mean value observed as 134 ppm is the highest value for hardness here.

TDS water parameter here for control range from 296 – 334.6 ppm and mean value recorded as 306 ppm and in case of neem oil the TDS value range from 290.70 – 315.8 ppm and mean value observed as 302 ppm for deltamethrin the value recorded 301 – 329.6 and mean value is 323 ppm while for cypermethrin the TDS value lies in between 310.75 – 342.10 ppm and highest mean value observed 335 ppm here for cypermethrin.

The salinity water parameter here range from 0.3 – 0.3 ppt and its mean value is 0.3 ppt recorded for control, neem oil, deltamethrin, cypermethrin.

Conductivity for water quality for control system lies in between 619.50 – 632.80µS/cm and mean

value exposed here is 630µS/cm. for neem oil, here value range from 611.05 – 627.00 µS/cm and mean value recorded is 618 µS/cm which is the least from neem oil. Deltamethrin where the highest mean value observed is about 664 µS/cm and value range from 631.20 – 669.40 µS/cm. in case of cypermethrin treatment water conductivity range from 576.5 – 613.40 µS/cm and mean value observed here as 596 µS/cm.

Alkalinity parameter of water, value for control here range from 107.116.50 ppm and mean value observed is 110 ppm. For neem oil, values here from 101.05 – 109.30 ppm and mean value is 106 ppm and for deltamethrin, the highest mean value observed as 166 ppm and value range from 139.10 – 171.00 ppm. For cypermethrin value range from 131.00 – 163.24 ppm and mean value 156 ppm which is observed as least value from all treatments.

Mean while neem oil insecticide treated water Physico chemical parameter near is non treatment water pond Physico chemical parameters But highly change and far to non treatment water in treatment of deltamethrin and cypermethrin treated water in pond.

100% mortality of zooplankton and phytoplankton were observed in deltamethrin and cypermethrin treatment in water pond and not developed again in duration if 20 days but no mortality of zooplankton and phytoplankton were observed in neem oil treatment. Growth rate of fish seed is high in control and neem oil compared to deltamethrin and cypermethrin.

## Conclusion

Neem oil claim for the production process and production practices as well as more production elusive

characteristics such as consumer expectation for quality and safety and general environment, social and economic benefits for fish culture and for society. Synthetic pyrethroid deltamethrin and cypermethrin contamination poses significant risks to the environment and non target organisms ranging from microorganisms, zooplankton, fish seeds, fishes in aquaculture or fresh water ponds and give deleterious effects on the environment. Newer biological insecticide is developed to replace deleterious chemical insecticide in fish nurseries and eco friendly.

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