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National Seminar
On

## RECENT TRENDS IN AQUATIC AND TERRESTRIAL BIOLOGY

22nd April – 2022

Organized by
P.G and Research Department of Zoology

## CERTIFICATE

This is to certify that Prof. / Dr. / Mr. / Ms. /
..M...RAMANI...BAI,.Associate.....professor
has participated / delivered an invited Lecture / presented a paper entitled A...study...on...the....bio-.accumulation of....copper....on.......silkworm,..Bombyx....mori.L in the National Seminar on Recent Trends in Aquatic and Terrestrial Biology held on 22nd April 2022, organized by the P.G and Research Department of Zoology, Muslim Arts College, Thiruvithancode, Kanyakumari – 629174, Tamil Nadu, India.

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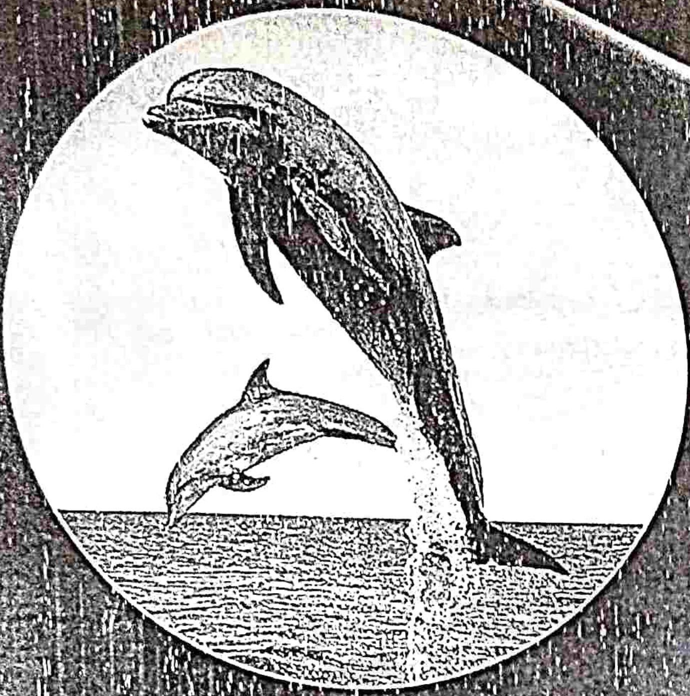
# RECENT TRENDS IN AQUATIC AND TERRESTRIAL BIOLOGY

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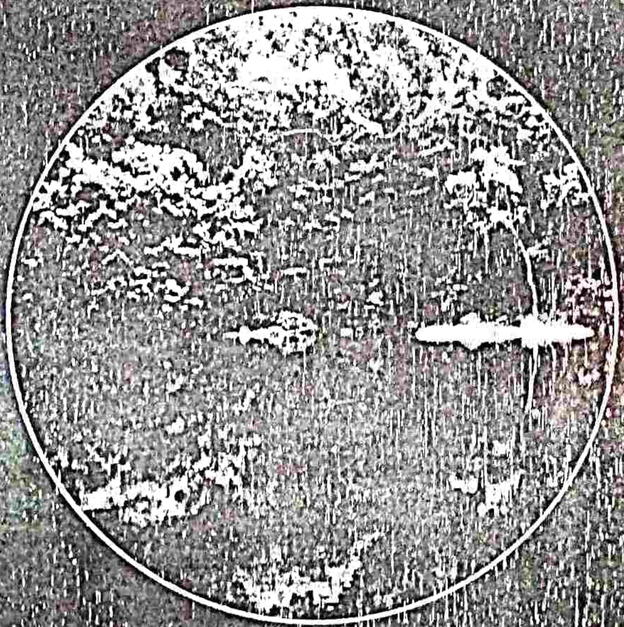

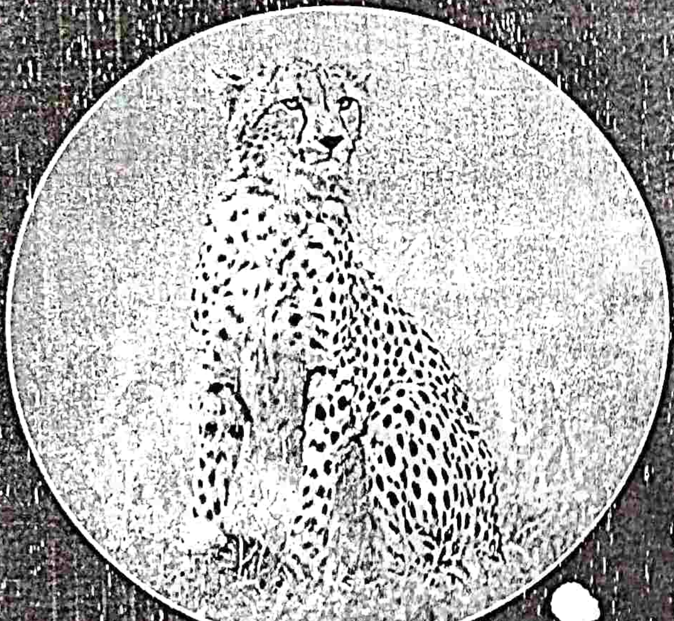


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# A STUDY ON THE BIO ACCUMULATION OFCOPPER ON SILKWORM, *BOMBYX MORI L.*

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**Abstract**

The present study was planned to evaluate the entrance of heavy metals into the food chain of *Bombyx mori* L. from mulberry plants irrigated using heavy metals containing synthetic effluents. The soil, leaf and silkworm larvae were sampled to determine heavy metals amount using Atomic Absorption Spectrometry (AAS). The maximum amount detected in soil, leaves and larvae were 0.18mg, 1.86mgand 2.024mg respectively. Significantly less amount (1 %)of copper treatment produces no adverse effect on silkworm,*B. mori.*

**Keywords:** copper, soil, heavy metal, bioaccumulation, *Bombyx mori*

## Introduction

Sericulture is the cultivation of the silkworms to produce the silk. Sericulture is also called the silk farming. Mulberry trees (Morus sp.) are present all over the world in tropical and sub-tropical regions, as a fast-growing perennial tree. Mulberry leaves nutritional values and yield is depended on the soil type and plant density. Yields of mulberries can be increased by irrigation and fertilization. Heavy metal contamination is one of the biggest environmental problems in soil. Toxic metals that come from industrial and domestic sources caused pollution of aquatic ecosystems (He et al., 1998). Spiegel, (2002) concluded that the living organisms are being damaged by these heavy metals in all the territories around the globe. Heavy metals are absorbed through the roots in plants. Heavy metals have toxicity for microorganisms, humans, plants and animals (Fotakis and Timbrell, 2006). The current research is planned to determine the accumulation of heavy metals on mulberry plant. The objective of the study is to determine the different effects of soil that is contaminated with heavy metals. During the study, production and development of silkworm larvae on the mulberry will be under consideration as well. Hence the present study was undertaken to evaluate the accumulation of copper on soil, mulberry leaf and silkworm larvae.

## Materials and Method

Under the prevailing environmental conditions mulberry plants were carefully chosen grow in pots and irrigated twice a week with three different concentrations via 1,2 and 3 per cent of copper solution and the samples were collected at different days (10,20,30,40 and 50) to check the accumulation of copper in soil, leaf and silkworm larvae. The control treatment was maintained by irrigating canal water. Only 5[th] instar larvae were used in the study. Fresh disease-free laying's of $PM_xCSR_2$ race was used for the present study. Newly hatched larvae reared as described by Krishnaswamy (1978). Subsequently, plant leaves were collected after a predetermined time. After washing extensively with deionized distilled water (DDW), these collected leaves were divided into two fractions. One fraction was used to feed the silkworm larvae and other was be used in atomic absorption spectroscopic (AAS) analysis.

### Digestion of mulberry leaves and silkworm larvae

One gram of dried and powdered mulberry leaves, silkworm and soil were wet digested according to the method described by Zubair et al., (2008). According to this method samples were dried in an oven till constant weight. One gram of dried sample was dissolved in 20 ml concentrated nitric acid and then heated it to till 10ml. After that 10ml of H2O2was used as discoloring agent. These wet digested samples were used in atomic absorption spectrometer (AAS).

## Result

### Accumulation of Copper in Soil, leaf and silkworm

The accumulation of copper in soil was measured after 10, 20, 30, 40 and 50 days from three different concentrations of copper sulphate (1%,2% and 3%). According to the table1 maximum concentration of copper accumulated was 98.31percentage after 50 days when the copper 3% was applied. Whereas, the control gave minimum accumulation after 10 days and maximum accumulation after 50 days (0.002mg and0.46 mg rsspectively). The accumulation of copper in leaf was measured after 10, 20, 30, 40 and 50 days when three different concentrations of copper sulphate applied (1%.2% and 3%). According to the Table:2 maximum concentration of copper accumulated was 84.88 percent after 50 days when the copper Of 3% was applied. Whereas, the control treatment gave minimum accumulation after 10 days and maximum accumulation after 50 days (1.001 mg and1.006 mg). The accumulation of copper in silkworm was measured after 10, 20, 30, 40 and 50 days with three different concentrations of copper sulphate applied (1%,2% and 3%). According to the Table:3 maximum concentration of copper accumulated was 2.024 mg after 50 days when 1% copper was applied. Whereas, the control treatment gave minimum accumulation after 10 days and maximum accumulation after 50 days (1.0002 mg and 1.0006 mg).

**Discussion**

The study of entrance of heavy metals into food chain is although very important but with a limited properly planned work. In this regard, the present study can play very important role in evaluating the transportation of heavy metals from inorganic sources to different life forms. The present study evaluated copper transformation from inorganic source to living organisms. The objective of the research was to evaluate the accumulation of heavy metals in soil, mulberry leaves and silkworm larvae, they were sampled to determine heavy metals concentration using Atomic Absorption Spectrometry (AAS).For the various treatments studied it was concluded that in treatment a maximum amount of heavy metals in soil, mulberry leaves and silkworm larvae were accumulated at the end of the experiment. Heavy metals present in B.mori bodies were responsible for toxic effects on its life cycle. The 5th instar of B.mori were most affected by heavy metals toxicity. Body length and body weight of B. mori decreased with an increase in heavy metals concentration which was bio accumulated in the larval body. This indicate at negative impact of heavy metals accumulation in silkworm larvae while minimal effect was observed at lower heavy metal concentration. Ashfaq et al., (2009) and Afzal and Hanifa (2009)reported significant accumulation of Zn in soil. The accumulation of metals was concentration dependent. Afzal (2009) studied the effects of Zn (II) on silkworm mortality rate and concluded similar results. Kamilova and Tsarev (2006). Ali (2009).Ashfaq et al., (2012). Shoukat et al., (2014) and Nikolova (2015) reported that significant mortality of silkworm was observed due to metal accumulation in silkworm larvae.Some other research workers studied Cd accumulation in silkworm larvae and found similar results like Nikolova (2015) and Prince et al. (2001). These findings clearly suggest that heavy metals presence in aqueous effluents used for plant irrigation should be strictly monitored.

**Table :1 Accumulation of copper (mg)in soil**

| Con (%) | Days | | | | |
|---|---|---|---|---|---|
| | 10 | 20 | 30 | 40 | 50 |
| Control | 0.002±0.0010 | 0.005±0.009 | 0.21+0.006 | 0.27±0.003 | 0.46±0.007 |
| 1 | 0.08±0.0014 (7.18) | 0.07±0.012 (6.4) | 0.53+0.009 (26.44) | 0.73±0.014 (36.22) | 0.83±0.015 (25.34) |
| 2 | 0.23±0.0018 (21.95) | 0.67±0.024 (66.16) | 0.80±0.37 (48.75) | 0.93±0.32 (51.96) | 0.97±0.94 (34.92) |
| 3 | 0.73±0.026 (72.65) | 0.80±0.13 (79.10) | 0.97±0.75 (62.80) | 1.01±1.30 (58.26) | 1.18±1.78 (98.31) |

Note: Percent deviation over control values in parenthese

**Table :2 Accumulation of copper (mg)in leaf**

| Con (%) | Days | | | | |
|---|---|---|---|---|---|
| | 10 | 20 | 30 | 40 | 50 |
| Control | 1.001±0.0011 | 1.003±0.0020 | 1.004±0.0012 | 1.005±0.0010 | 1.006±0.0002 |
| 1 | 1.02+0.0013 (1.89) | 1.04±0.009 (3.68) | 1.21+0.013 (19.52) | 1.26+0.015 (25.61) | 1.36±0.011 (35.18) |
| 2 | 1.05±0.030 (4.89) | 1.13±0.046 (11.96) | 1.48±0.050 (47.40) | 1.57±0.039 (56.21) | 1.55±0.15 (54.07) |
| 3 | 1.07±0.060 (6.89) | 1.24±0.058 (22.93) | 1.65±0.073 (64.40) | 1.84±0.19 (83.08) | 1.86±0.16 (84.88) |

Note: Percent deviation over control values in parentheses

**Table :3 Accumulation of copper (mg)in silkworm**

| Con (%) | Days | | | | |
|---|---|---|---|---|---|
| | 10 | 20 | 30 | 40 | 50 |
| Control | 2.0002± 0.00010 | 2.0003± 0.00014 | 2.0004± 0.00012 | 2.0005± 0.000017 | 2.0006± 0.00011 |
| 1 | 2.001±0.013 (0.07) | 2.004±0.093 (0.36) | 2.018±0.085 (1.75) | 2.020±0.098 (1.95) | 2.024±0.072 (2.33) |
| 2 | 2.002±0.069 (0.17) | 2.013±0.054 (1.26) | 2.014± 0.075 (1.35) | 2.016±0.049 (1.54) | 2.019±0.080 (1.83) |
| 3 | 2.009±0.071 (0.87) | 2.016±0.048 (1.56) | 2.016±0.057 (1.55) | 2.018±0.083 (1.74) | 2.020±0.094 (1.93) |

Note: Percent deviation over control values in parentheses

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