The Biobrio ISSN : 2393-9508 e-ISSN: 2582-4902
An International Quarterly Journal of Life Sciences
Website: www.thebiobrio.in SJIF 2023:8.16
10 (3&4): 1010-1012, 2023

Evaluating changes in mean corpuscular volume blood parameters in *Cirrhinus mrigala* on imidacloprid exposure

Wasim Raza[1], Nirmala Tripathi[2] & Harishankar Mahto[3]
[1]Department of Zoology, Sahibganj College, S.K.M. University, Dumka, Jharkhand, India
[2]University Department of Zoology, S.K.M. University, Dumka, Jharkhand, India
[3]Department of Zoology, St. Paul's College, Ranchi University, Ranchi, Jharkhand, India

Received : 08th July, 2023 ; Accepted : 08th August, 2023

ABSTRACT

Imidacloprid, a widely used neonicotinoid insecticide, has raised concerns due to its potential environmental impact. This study investigates the effects of imidacloprid exposure on the Mean Corpuscular Volume (MCV) blood indices in *Cirrhinus mrigala*, providing insights into the hematological response of this species to pesticide exposure. The primary aim of this research is to assess alterations in MCV blood indices in *Mrigala* following exposure to imidacloprid, elucidating potential implications for the health and physiological well-being of the organism. *Mrigala* specimens were exposed to controlled concentrations of imidacloprid, and blood samples were collected for hematological analysis. MCV measurements were conducted using established laboratory techniques. Statistical analyses were employed to interpret the observed changes in MCV values. Preliminary results indicate significant decrease in MCV blood indices in Mrigala following exposure to imidacloprid. These findings suggest a hematological response to pesticide exposure, emphasizing the potential impact on the Red Blood Cell volume distribution in this species. This study provides novel insights into the hematological effects of imidacloprid exposure on *Mrigala*. The observed changes in MCV blood indices underscore the importance of understanding the sublethal effects of pesticides on non-target organisms. Further investigations are warranted to elucidate the underlying mechanisms and to assess the broader ecological consequences of imidacloprid exposure in aquatic ecosystems.

Key Words - *Cirrhinus mrigala*, Mean Corpuscular Volume (MCV), Hematology, Fish Health, Imidacloprid

***Corresponding author :** harry.keshaw@gmail.com

INTRODUCTION

The escalating use of pesticides in agricultural practices has led to growing concerns about their potential environmental impact. Imidacloprid, a widely employed neonicotinoid insecticide, has gained attention due to its persistence in aquatic ecosystems and potential adverse effects on non-target organisms (Malhotra *et al.,* 2021). Among these organisms, fish species such as Cirrhinus mrigala play a crucial role in aquatic ecosystems and are particularly vulnerable to the effects of waterborne contaminants (Debnath *et al.,* 2012).

Hematological parameters, including Mean Corpuscular Volume (MCV), serve as vital indicators of the physiological health of fish (Chen & Luo, 2023). Changes in MCV can reflect alterations in red blood cell volume, providing valuable insights

into the organism's response to environmental stressors such as pesticide exposure (Burgos *et al.,* 2019). Understanding the hematological effects of imidacloprid on *Cirrhinus mrigala* is essential not only for assessing the immediate health status of the fish but also for elucidating the potential ecological consequences within aquatic ecosystems.

This study aims to comprehensively evaluate alterations in MCV blood parameters in *Cirrhinus mrigala* following exposure to imidacloprid. By investigating the impact of this neonicotinoid insecticide on the hematological profile of *C. mrigala*, we seek to contribute valuable information to the broader field of aquatic toxicology and enhance our understanding of the sublethal effects of pesticides on non-target organisms. The findings of this research may have implications not only for fish health but also for the overall ecological integrity of aquatic ecosystems exposed to imidacloprid contamination.

METHODOLOY

Sample Collection: Conducted a controlled laboratory experiment to simulate imidacloprid exposure in *Cirrhinus mrigala*. Healthy *mrigala* specimens acclimatized to laboratory conditions, ensuring appropriate water quality, temperature, and photoperiod to mimic natural habitat conditions.

Imidacloprid exposure: Administered imidacloprid to the treatment groups according to 20 PPM, 50 PPM, 75 PPM, 100 PPM & 125 PPM & 150 PPM concentrations (Ghayyur *et al.*, 2021). Ensured constant exposure throughout the experimental period and monitored water parameters regularly to maintain environmental stability.

Blood collection: Collected blood samples from the fish at 8 hours, 16 hours, 24 hours, 48 hours & 96 hours during and after the exposure period(Sharma & Chadha, 2021). Used appropriate anesthetic and handling procedures to minimize stress and ensured ethical treatment. Included positive and negative controls to validate the experimental setup and ensured data reliability.

Hematological analysis: Performed hematological analyses, with a specific focus on Mean Corpuscular Volume (MCV). Utilized standard laboratory techniques to measure MCV, including automated blood cell counters and microscopy (Ryan, 2001).

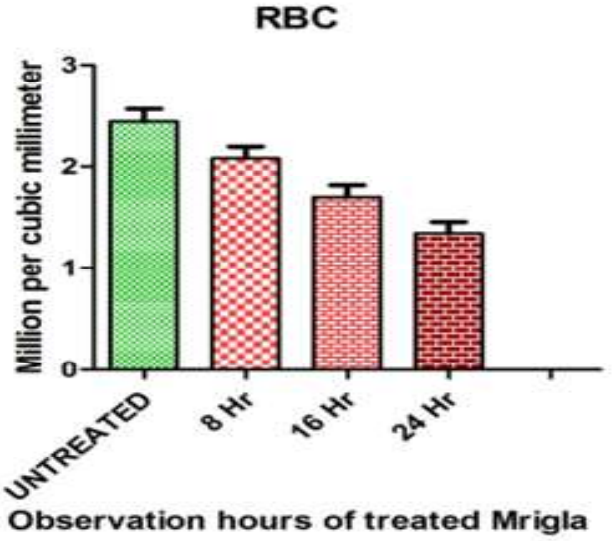
Data analysis: Employed statistical methods to analyze the MCV data, comparing values between the control and treatment groups. Conducted one-way ANOVA test to identify statistically significant differences (Ross & Willson, 2017) in MCV between healthy and treated groups of *mrigala*.

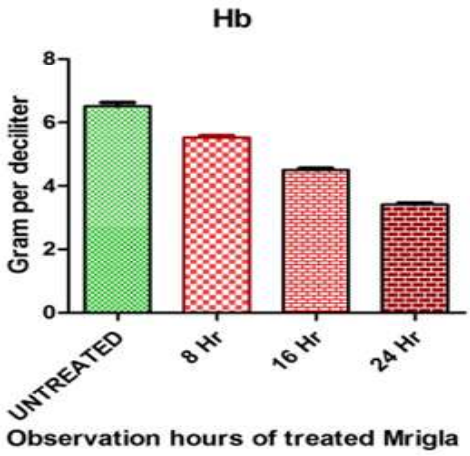
RESULT

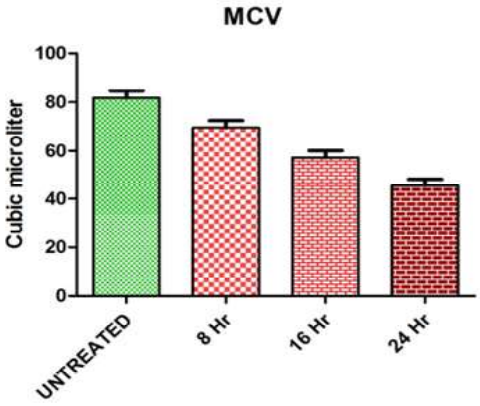
Our study aimed to evaluate the impact of imidacloprid exposure on the hematological parameters, particularly the Mean Corpuscular Volume (MCV), in *Cirrhinus mrigala*. We observed a LC50 on 100PPM after 24 hours of treatment where we found significant decrease in MCV and other hematological parameters in the treatment

Table 2: Study of Hematological parameters in imidacloprid treated Mrigala

Parameters	Untreated	100ppm in 24 hr
WBC	5200 cu mm	9400cu mm
Platelets	1.62	0.89 lakh/cmm
RBC	2.44	1.34 million/cu mm
Hb	6.5 gm/dl	3.4 gm/dl
MCV	81.96	45.50 cu µ
MCH	26.63	14.01 pg
MCHC	32.50	17.41 %







groups compared to the control group. MCV decreased by 40% compared to the control group.

Hemoglobin, RBC and Platelets Count decreased significantly in all treatment groups, indicating possible anemia. While WBC Count increased in the treatment groups, suggesting a stress response or immunological reaction. The differences in MCV and other hematological parameters between the control and treatment groups were statistically significant ($p < 0.05$).

CONCLUSION

This study provides vital insights into the negative effects of imidacloprid on the hematological health of *Cirrhinus mrigala*. The significant alterations in MCV and other blood parameters point towards the urgent need for re-evaluating the environmental safety of this widely used insecticide. Protecting aquatic life forms and maintaining the health of ecosystems should be a priority in the context of increasing environmental pollution.

REFERENCES

Burgos-Aceves, M. A., Lionetti, L., & Faggio, C. 2019. Multidisciplinary haematology as prognostic device in environmental and xenobiotic stress-induced response in fish. *Science of the total environment,* 670:1170-1183.

Chen, H., & Luo, D. 2023. Application of haematology parameters for health management in fish farms. *Reviews in Aquaculture,* 15(2): 704-737.

Debnath, M., Saha, R. K., Kamilya, D., Saikia, D., & Saha, H. 2012. Effects of water borne iron on spawn of Indian major carps (*Catla catla* (Ham.), *Labeo rohita* (Ham.) and *Cirrhinus mrigala* (Ham.). *Bulletin of environmental contamination and toxicology,* 89: 1170-1174.

Ghayyur, S., Khan, M. F., Tabassum, S., Ahmad, M. S., Sajid, M., Badshah, K., 2021. A comparative study on the effects of selected pesticides on hemato-biochemistry and tissue histology of freshwater fish *Cirrhinus mrigala* (Hamilton, 1822). *Saudi Journal of Biological Sciences*, 28(1): 603-611.

Malhotra, N., Chen, K. H. C., Huang, J.-C., Lai, H.-T., Uapipatanakul, B., Roldan, M. J. M., et al. 2021. Physiological effects of neonicotinoid insecticides on non-target aquatic animalsâ€"an updated review. *International Journal of Molecular Sciences,* 22(17):9591.

Ross, A., & Willson, V. L. 2017. One-way anova. In Basic and advanced statistical tests (pp. 21-24): Brill.

Ryan, D. H. 2001. Examination of the blood. *Williams hematology,* 6: 9-16.

Sharma, P., & Chadha, P. 2021. Bisphenol A induced toxicity in blood cells of freshwater fish Channa punctatus after acute exposure. *Saudi Journal of Biological Sciences*, 28(8): 4738-4750.