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Effect of profenophos on the haematology of freshwater climbing perch *Anabas testudineus*

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Abstract
The present study aimed to investigate the effects of sublethal concentrations of pesticide profenophos on the haematological parameters (RBC, WBC and Hb content) of freshwater climbing perch *Anabas testudineus*. Fishes exposed to 10% and 30% sublethal concentrations of profenophos (96 h LC_{50} – 0.5 ppm) for 10,20 and 30 days. The RBC and Hb content of blood decreased after chronic exposure to the profenophos. On the contrary, there was an increase in the WBC count of fish following their exposures to profenophos compared to the corresponding control.

Keywords: *Anabas testudineus*, haematology, pesticide

Introduction
The inland fisheries are important sources of proteins in a nation's diet and so a thorough understanding of the effect of pesticides on fishes will be of immense use for fisheries development. Many investigators have been made regarding the effect of pesticides a various physiological, biochemical and histological studies. Defective biochemical metabolism (Ghazala Ghazala *et al*., 2019 and Sandhya Bharathi and Fazle Rasool, 2021) [9, 22], reduced oxygen consumption in gill tissue (Rahman and Sadhu, 2009) [21], damaged respiratory system (Sucitha *et al*., 2018; Arumugam Stalin *et al*., 2019 and Greeshma *et al*., 2012) [24, 4, 10] have been reported in fishes after exposure to sublethal concentrations of pesticides. Attempts have been made to report the effect of various pesticides on the haematology of fishes (Anita Bhatnagar *et al*., 2017 and Mohammad Amzad Hossain *et al*., 2022 [2, 15]. With the increasing emphasis on aquaculture and great awareness of the aquatic pollution, haematological studies in fishes have assumed greater significance. Hence the present investigation, an attempt has made to study the effect of pesticide profenophos on the haematology of freshwater climbing perch *Anabas testudineus*.

Materials and Methods
The freshwater climbing perch, *Anabas testudineus* (6- 7 cm length & 4.5 – 5 g weight) was obtained from MNR Aqua Farm, Orathanadu and transported in plastic containers to the laboratory. Per cent mortality was calculated and the values were fitted into probit scale. (Finney, 1971). Based on the acute toxicity test (96 h LC_{50} – 0.5 ppm) sub lethal concentrations (10% and 30%) of profenophos were prepared and were used as the experimental concentration of the profenophos in the subsequent experiments. Ten fishes were exposed to each concentration for a period of 10, 20 and 30 days. Simultaneously a control batch was maintained.
Blood sample was collected from caudal vein of fish with 21G hypodermic needle plastic syringe and stored in glass tubes containing EDTA. The red blood cell and white blood cells count were made using Neubauer haemocytometer. Haemoglobin of blood sample was estimated by acid hematic method (Dacie and Lewis, 1991) [7].

Results and Discussion
The toxic effects of pesticide profenophos on the blood parameters of *Anabas testudineus* such as number of red blood corpuscles (RBC), white blood corpuscles (WBC) and hemoglobin content (Hb). The observations were made at the end of exposure periods (10, 20 and 30 days) to calculate the percentage of increase and decrease of different blood parameters.
The total RBC count showed a significant decreasing trend in the fish *Anabas testudineus* exposed to 10 and 30% sub lethal concentrations. A marked decrease of 7.45, 5.99 and 13.24% were recorded in the number of RBCs reared in 10% sub lethal concentration and 18.34, 30.54 and 47.89% in 30% sub lethal concentration of 10, 20 and 30 days exposure respectively (Fig. 1).
The decreased total red blood cell count were observed by many investigators. Similar observations are made available in fishes treated with sublethal concentrations of several pesticides. Safiya Tazeen *et al*. (2015) [21] found decrease in the number of RBC of *Notopterus notopterus* exposed to profenofos.
The results recorded in the present study corroborate the previous findings in *Oreochromis niloticus* by Yaji *et al*. (2018) [25] after exposure to pesticide Aronil. Jugime Mankuzhiyil Sivanandan and Binukumari (2021) have made observations with decreased values of RBC in the Indian major carp *Labeo rohita* when exposed to malathion. In *Anabas testudineus* the decreased values of red blood cells and haemoglobin may be due to the disruptive action of pesticide profenophos on the erythropoitic tissues, as evidenced in *Barbonymus goniontus* after exposure to pesticide sumithion, (Kamrunnaher kole *et al*., 2022) [13].
There is a positive trend in the WBC count of *Anabas testudineus* with the increasing concentration of pesticide. The increase in number of WBCs was found to be 18.24, 25.84% and 38.98% and 29.49, 38.49 and 47.25% in 10% and 30% sub lethal concentrations at 10, 20 and 30 days exposure, respectively (Fig. 2).

Mageswari *et al*. (2018) [14] reported an increased in the number of WBC count of *Channa striatus* exposed to organo sulfuric pesticide propargite. Bamidele Adewumi *et al*. (2018) [6] observed an elevation of WBC in chlorphrifos and DDforce, an organophosphate insecticides exposed *Clarias gariepinus*, juveniles. Kamrunnaher Kole *et al.* (2022) [13] reported number of white blood cells were elevated in *Clarias gariepinus* exposed to diazinon. They have suggested that significant increase in WBC count in the fish could be due to leukocytosis in fish stimulates immunological defense.

The haemoglobin content showed decreasing trend in the treated fishes compared to control. The haemoglobin content of the fish in 10% and 30% sub lethal concentrations showed decreasing trend with a significant reduction of 26.37, 35.5, 50.97% and 42.92%, 53.37, 73.22% at 10, 20 and 30 days of exposure, respectively (Fig. 3).

Similar decrease in haemoglobin content were observed by many investigators in different fish species: *Cirrhinus mrigala* exposed to sublethal concentrations of concentrations of chlorphyrifos (Anita Bhatnagar *et al*., 2017) [2], *Labeo rohita* to monocrotophos (Anusiya *et al*., 2015) [3], *Mystus keletius* to selected pesticides *viz.*, Ekalus, Impala and Neemstar (Ayyanar Barathinivas *et al*., 2022) [5] and grass carp, *Ctenopharyngodon idella* to agrochemical such as emamectin, acetochlar and topsin – M, (Muhammad Fiaz khan *et al*., 2022) [16].

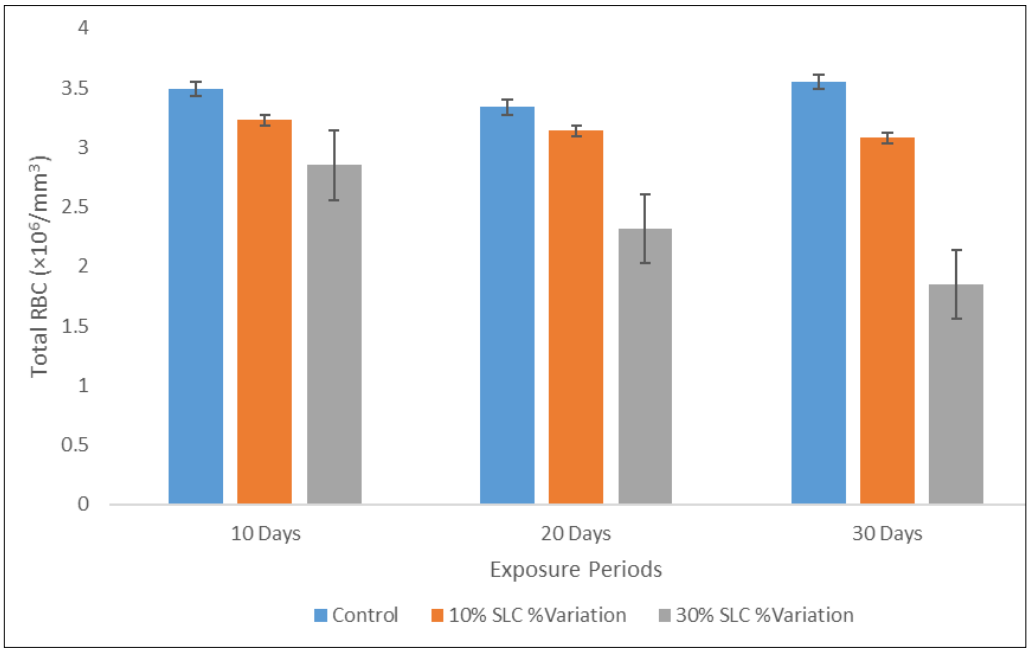

Fig 1: Red blood cell counts of freshwater climbing perch *Anabas testudineus* under sublethal concentrations of profenophos (×10^6/mm^3)

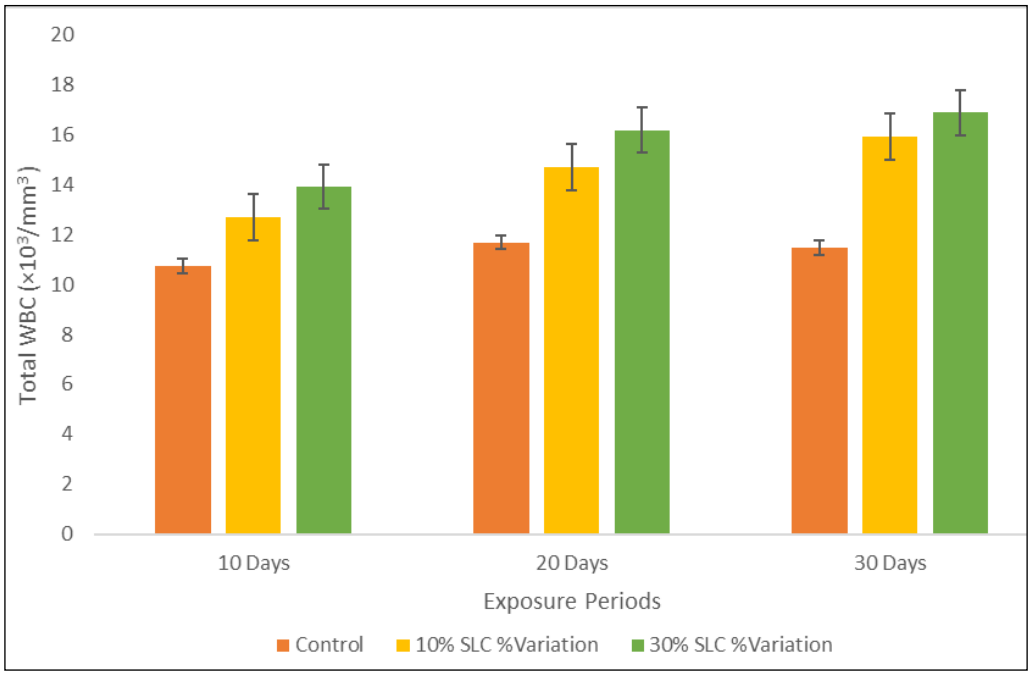

Fig 2: White blood cell counts of freshwater climbing perch *Anabas testudineus* under sublethal concentrations of profenophos (×10^3/mm^3)

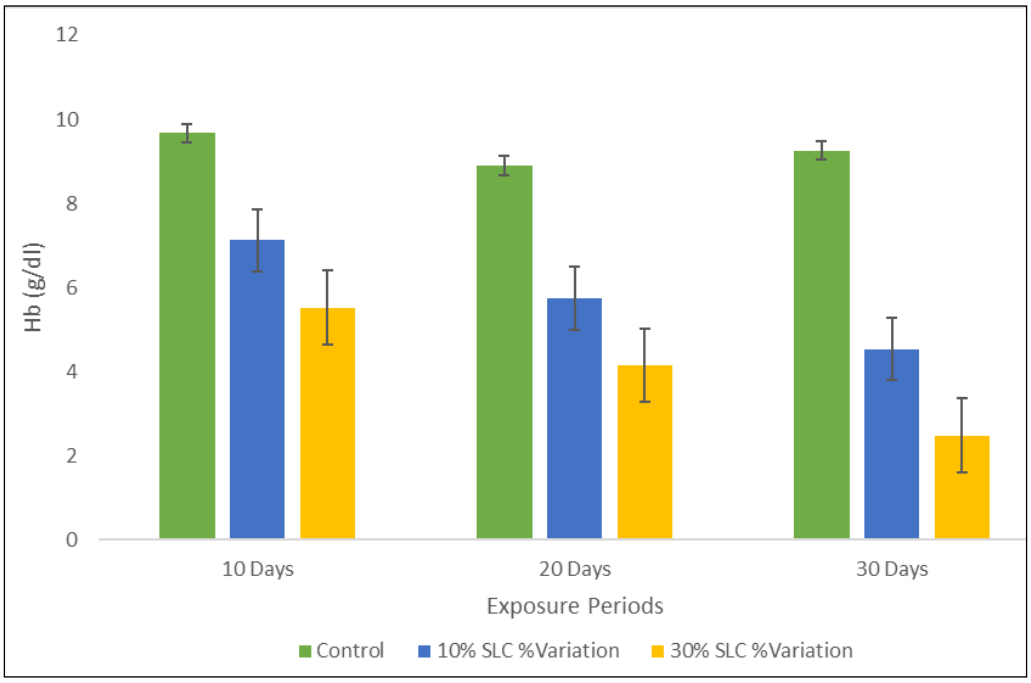

Fig 3: Haemoglobin content of freshwater climbing perch *Anabas testudineus* under sublethal concentrations of profenophos (g/dL)

Conclusion

It can be concluded from this finding that the pesticide profenophos has the potential alterations in these haematological indices of the fish may provide early warning signals for the toxic level of pesticide. Hence, usage of pesticides in agroecosystem should be restricted in order to reduce its potential health risk to aquatic system.

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