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SHORT COMMUNICATION **OPEN ACCESS**

Analysis of Alterations Induced by Synthetic Pyrethroid and Its Modulation by LIV 52 in Blood of Channa punctatus Using Protein profiling (SDS-PAGE)

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ABSTRACT
Pesticides are major cause of concern for aquatic environment because of their toxicity, persistency and tendency to concentrate in organisms as they move up the food chain, increase their toxicity to fish, birds and other wildlife and, in turn to man. The present study is aimed to evaluate the changes in protein content in the blood of Channa punctatus after exposure to 96 h LC50 of Deltamethrin. During the present investigation we observed significant alterations in protein contents in the blood of Channa punctatus exposed to Deltamethrin at different concentrations and exposure periods. There was a concentration-dependent inhibition in the total protein contents. On the other hand, these parameters were significantly controlled in blood of treated fishes exposed to Liv. 52.
Key words: Deltamethrin, synthetic pyrethroid, protein profile (SDS-PAGE), Channa punctatus, Liv 52.

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INTRODUCTION

Environmental pollution has emerged as a serious threat to human survival, with aquatic ecosystems being particularly vulnerable. Rapid population growth, along with intensified agriculture and expanding industrial and domestic activities, has significantly contributed to water contamination. Among commonly used pesticides, synthetic pyrethroids such as deltamethrin are widely applied due to their effectiveness in pest control. However, these compounds are highly toxic to non-target aquatic organisms, especially fish and zooplankton [1-2].

Most insecticides exert their effects by disrupting neural function. Pyrethroids lacking an alpha-cyano group typically induce repetitive nerve firing and muscle contractions, whereas those containing the alpha-cyano group show limited visible nerve excitation even at advanced stages of toxicity. Previous studies have demonstrated that deltamethrin induces biochemical and histopathological alterations in fish, even at low concentrations. One of the key mechanisms underlying its toxicity is the generation of oxidative stress in various tissues [3-5].

The observed decline in protein content may result from stress-induced metabolic adjustments, where proteins are broken down to meet increased energy demands under toxic conditions. Correspondingly, elevated levels of free amino acids indicate enhanced proteolysis and impaired protein synthesis [6].

SDS-polyacrylamide gel electrophoresis (SDS-PAGE), a widely used technique for qualitative protein analysis based on molecular size, revealed significant alterations in the protein banding pattern of *Channa punctatus* following deltamethrin exposure. Notably, treatment with Liv 52 helped restore the normal protein profile, suggesting its protective role against pesticide-induced toxicity.

MATERIAL AND METHODS

The live specimen of *Channa punctatus* commonly known as "soli" were brought for the present study from ponds in surrounding vicinity of Agra and fish market of Agra. The diluent water that was used for keeping experimental fishes was subjected to analysis for various physico-chemical characteristics as per procedure given in "APHA [2] standard methods for the examination of water and waste water". After fifteen days acclimatization, a lot of five fishes each was transferred to small aquarium each containing twenty-five litres of water. They were subjected to a specific pollutant viz. deltamethrin with concentration developed.

Gel Electrophoresis (PAGE) [4]

Total protein was extracted in protein extraction buffer pH 7.4 on 16000 rpm at 4^0 C using REMI Cooling Centrifuge, we wash glass plate with detergent and water, and then rinse it with alcohol. Assembling the plates and seal properly with paraffin wax or agarose. Preparing 7% gel, mix and poured gel into gel sandwich.

Then we pour 500µl deionized distilled water on the top of the gel to keep the surface smooth. Allow the gel to polymerize at room temperature for 30-45hrs. Wash it twice with Tris (pH=6.8). Mix 5% stacking gel. Place the comb between the gel and the plate and pour the stacking gel. No air bubble should be trapped under slots in the comb. After polymerization remove comb and wash well with running water. Assemble it in electrophoretic apparatus and fill cathode and anode chambers with buffer. Load 5- 10µl heat treated samples. Connect it with a power supply, run at 50V till the dye reaches 1cm above the bottom of the gel. Dissemble the gel setup, stain with coomassie blue and observe the separated protein bands.

RESULTS AND DISCUSSION

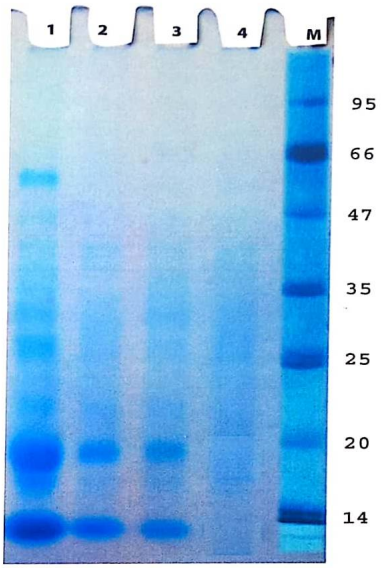
Fig. 1 illustrates the SDS-PAGE protein profile of blood under different experimental conditions. The control group (Lane 1) exhibited a normal and well-defined banding pattern, indicating the presence of intact and stable protein fractions. In the Liv 52-treated group (Lane 2), the protein profile was largely comparable to the control, suggesting that Liv 52 alone does not induce any adverse alterations in blood proteins and may help maintain protein integrity.

In contrast, the deltamethrin-treated group (Lane 4) showed marked alterations in the banding pattern, including the disappearance of some protein bands and the appearance of faint or diffused bands. These changes indicate protein degradation, denaturation, or impaired synthesis, likely due to toxic stress induced by deltamethrin exposure. Such disruptions in protein profiles reflect metabolic imbalance and possible damage to cellular components, consistent with pesticide-induced oxidative stress [7].

Interestingly, the combined treatment group (Deltamethrin + Liv 52, Lane 3) demonstrated a partial restoration of the normal banding pattern. Several protein bands reappeared or became more distinct compared to the deltamethrin-only group, suggesting a protective or ameliorative effect of Liv 52 against pesticide toxicity. This recovery may be attributed to the antioxidant and hepatoprotective properties of Liv 52, which help reduce oxidative damage and support protein synthesis [8].

The marker (Lane M) served as a reference for molecular weight determination, confirming that the observed changes correspond to proteins of varying sizes. Overall, the findings indicate that deltamethrin induces significant alterations in blood protein composition, while Liv 52 mitigates these effects and helps maintain protein stability under toxic stress conditions.

Fig 1: Protein Profile of Blood with Respect To Different Conditions As Mentioned



1. Control 2. Liv 52; 3. Deltamethrin + Liv 52
4. Deltamethrin; 5. Marker

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