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Impact of profenofos on protein content of freshwater bivalve, *Lamellidens corrianus* (Lea)

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Abstract
Agrochemicals that are used as pesticides are not highly selective but are generally toxic non-target species, including man, and other desirable forms of life that co-inhabits the environment. Pesticide is bioavailable; there will be uptake in the organism and interaction with receptor site, which may evoke measurable biological effects. Profenofos was used as pesticide widely in India. Protein content in foot, mantle and gills of freshwater bivalve *Lamellidens corrianus* exposed to acute treatment of Profenofos were studied in the present investigation.

Keywords: profenofos, protein, *Lamellidens corrianus*

Introduction
Toxicity of a substance refers to its capacity to cause adverse effects on living organisms and the term is more commonly used to compare the impact of two or more substances. Toxic impact may bring physiological, biochemical or pathological alteration in organisms. Chemicals originating from agricultural activity enter the aquatic environment through atmospheric deposition, surface run-off or leaching (Kreuger *et al*., 2016) [5] and (Pardeshi *et al*., 2016) [15] and frequently accumulate in soft-bottom sediments and aquatic organisms (Miles and Pfeuffer, 1997; Lehotey *et al*., 1998) [10, 6]. Extended occupational exposure of many environmental chemicals caused adverse effects in the biological system (Abdollahi *et al*., 2014) [1]. Pesticides are toxic and designed to kill unwanted organisms, but applied to the land they may be washed into surface waters and kill or, at least adversely influence, the life of aquatic organisms, pesticides due to their potential toxicity produce biochemical changes in the tissues and organs of exposed animals (Shastry *et al*., 2017) [18]. Considerable interest in molluscs, being the source of food to man has resulted in the accumulation of much data on a variety of biochemical features of the phylum. (Rane *et al*., 2013) [16]. The knowledge of chemical composition of any edible organism is extremely important since the nutritive value is reflected in its biochemical contents (Rao *et al*., 1987) [17]. The synthetic pyrethroids are among the most potent and effective insecticides available, accounting for more than 30% of the world market in insecticides (Milam *et al*., 2000) [9]. Profenofos belongs to a group of chemicals called pyrethroids. Pyrethroids are manmade chemicals that are similar to the natural insecticides pyrethrins. Protein is the most indispensable food material for growth, development and maintenance of life. Numerous studies have been reported the alteration in protein content in different organs exposed to toxicants like heavy metals and organophosphorus pesticides in bivalve (Chaudhari, 1999; Mahajan, 2006; Nandurkar and Zambare, 2010b; Kamble *et al*., 2010 and Patil, 2011) [3, 8, 11, 4, 13]. Therefore, the Present study was undertaken to investigate the protein content and probable role of this biochemical component in the freshwater bivalve, *Lamellidens corrianus* after acute exposure to Profenofos.

Materials and Methods
The bivalves *Lamellidens corrianus* were collected from the Girna dam, near Jamda, Chalisgaon, Maharashtra, India. They were cleaned and acclimatized for three days to dechlorinate tap water. Only healthy and active bivalves were chosen for experiments and eight groups were formed. Each group contained six animals. Four of the eight groups were considered as experimental group exposed to Profenofos for 24, 48, 72 and 96 hours for acute exposure. Remaining four groups was treated without pollutants and was considered as control. $LC_{50}/2$ concentration value of 96 hours was taken for acute exposure (0.39 ppm). Control and experimental bivalves were dissected and their foot, mantle and gills were separated. Immediately100 mg of each tissue was homogenized in phosphate buffer solution strictly in cold conditions separately. Homogenate was centrifuged at 3000 rpm for 5 minutes and supernatant was collected and it was used for estimations of protein contents. Total proteins were estimated by using a standard method of Lowry *et al*., 1951. The Bovine serum albumen was used as a standard. The treated groups were compared to control by One-way ANOVA with Dunnett's post test was performed using Graph Pad Prism Demo version 4.00 for Windows, GraphPad Software, San Diego California USA, was used, Differences were considered significantly when $p<0.05$.

Results
The changes in biochemical composition of foot, mantle and gills of freshwater bivalve *Lamellidens corrianus* exposed to acute treatment of Profenofos was studied along with control animals with respect to the mg% of protein in fresh tissue. The protein content of the foot, mantle and gills was found to be

depleted after acute treatment of Profenofos. The percent variation of protein over control after 96 hrs treatment with Profenofos in foot was 19.80, in mantle were 20.85 and in gills were 32.98. The depletion in protein content was found in all tissues after pesticide stress as the period of exposure increased (Fig. 1 to 3).

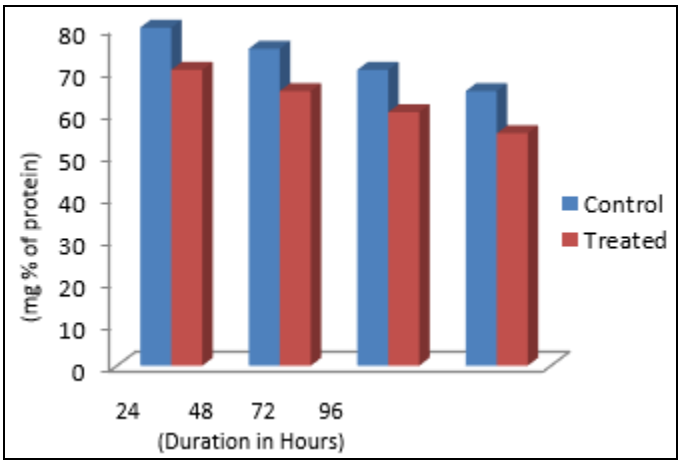

Fig 1: Change in Protein content in foot of *Lamellidens corrianus* exposed to Profonos

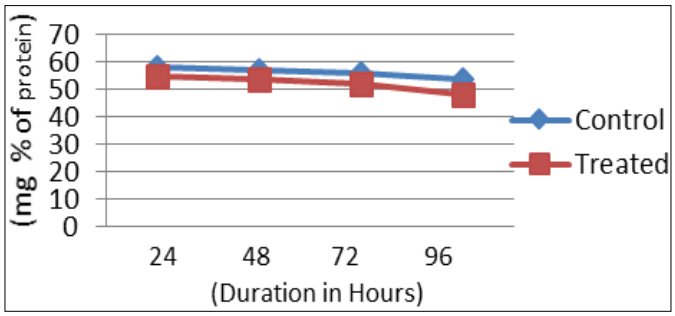

Fig 2: Change in Protein content in mantle of *Lamellidens corrianus* exposed to Profonos

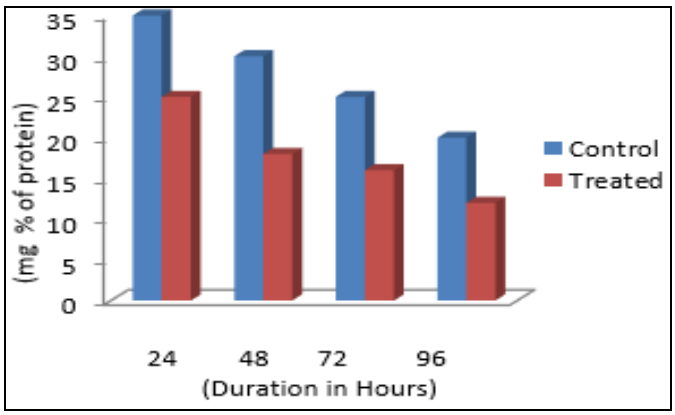

Fig 3: Change in Protein content in gills of L. *corrianus* exposed to Profonos

Discussion

Agents like heavy metals, organic compounds, metallic pollutants and agrochemicals adversely affects on many non target organisms like fishes, bivalves, prawns, crabs, etc. of the aquatic ecosystem. These environmental pollutants bring about damage to different organs and disrupt the physiological and biochemical processes in the organisms. Physiological activity of animal was indicated by the metabolic status of proteins. In present investigation, depletion in total protein content was noted in the foot, mantle and gills of *Lamellidens corrianus* exposed to Profenofos. This was possibly due to stress condition caused by toxicity of pyrethroid, Profenofos on protein metabolism. Similar results were noted by Pardeshi and Gapat, (2012) [14] during nickel intoxication in the freshwater bivalve. Andhale and Zambare (2011) [2], studied the nickel induced biochemical alterations in freshwater bivalve, *Lamellidens marginalis* and reported that the protein contents were decreased in treated animals than the control. Digestive gland may be the site of degradation and detoxification of agrochemicals and hence has the largest demand of energy for the metabolic processes resulting into increasing utilization of protein to meet energy demand, the total protein content was found depleted in foot, mantle and gills. Declination in protein content suggests that an increase in proteolytic activity and utilization for metabolic purpose. Neelamegam *et al*., (2006) [12] discussed the fall in protein level during exposure may be attributed to increased catabolism and decreased anabolism of proteins. In nutshell, protein content in foot, mantle and gills was found to be decreased compared to control might be due to the toxic stress caused by Profenofos.

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