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Detrimental effect of Rogorin 30 EC on the Gill of Clarias batrachus

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ABSTRACT: Environmental pollution especially pollution of water bodies by injudicious use of agro chemicals in field crops is posing serious problem to fisheries and aquaculture. The potential of fisheries to contribute to the country's economic advance is vast and still untapped having high potential. Efforts are being done to channalize the development in this sector as any instrument growth development and prospective. Equally important in the recent year is to promote the fish for all for livelihood diversification of crop which is facing acute agrarian crisis. Aquaculture are a vital source of supplentary income for farmers that objective ties in with the vision of double farmer's income by boosting fishery production.

The freshwater fish Mangur- the cat fish- Clarias batrachus is Bihar's State fish and produced throughout the state in fresh water which is expose to agrochemical. A scientific and systematic investigation was carried out to asses the effect of pesticide Rogorin 30 EC on the fresh water fish Clarias batrachus . The study material was exposed to lethal (5.012 ppm) and sublethal (2.506 and 1.253 ppm) concentrations of Rogorin for 96 h and 60 days, respectively. Biochemical changes in the gills were analyzed after scheduled exposure period. Exposure of fish to lethal and two sublethal concentration of Rogorin indicated significant detrimental effect in the protein content in the gills. Lethal dose exposure to the fish showed, significant change in the protein content. However, the sublethal exposure. Glycogen, cholesterol and ascorbic acid contents in the gills was observed to be decreased by induced Rogorin exposure.

Key words: Aquatic, biochemical Lethal and sublethal toxicity, Rogorin, Mangur, Clarias batrachus, detrimental.

I. INTRODUCTION :

Fishery sector plays an important role in indian economy and has assumed larger proportion keeping in view its significant and become a commercial enterprize. However, the sector is threatened due to the pollution problem which has taken fish farmers to think twice. In judicious use of pesticide in agriculture is harming the water body immensly which is resulting in high fish mortality as well as fish produce unsuitable for human consemption (Aktar et al. 2008). India is today the world second largest fish producer touching total fish production to 14.8 million tons, of which 65% is from inland sector. The fish account for the largest share of agricultural exports in value tons, fish exports is approximately fifty thousand crore last year, which contributed 5.76% of the GDP of agriculture and large sector. Our country has an exclusive economic zone of 2.17 million square kilometer, which is equivalent about two third of countries landmass. It also has 8,129 kilometer on coastline, 3.9 million hectare of estuaries, 5 million hectares of mangroves, 197, 024 kilometer of canal, 3.15 hectare of reservoirs, and 235 million hectares of pond and tank (Sanjeev Kumar, 2020). For fish production sky is the limit only in India (Swaminathan MS et al. 2020).

The waterbodies in Indo gangetic plains are getting large quantity of residue of pesticide and agrochemical used in agriculture field which creats serious echological problems.

These agrochemicals are highly injurious to non target organisms like fish. Fishes are sensitive to a wide variety of toxicants in water; various species of fish shows uptake and accumulation of many contaminants or toxicants such as pesticides (Cengiz et al. 2006, Amit Kumar et al. 2010). Accumulation of pesticides in tissues produces many physiological and biochemical changes in the fishes and freshwater fauna by influencing the activities of several enzymes and metabolites (Lipika et al. 2006, Ullah et al. 2015). The alteration in biochemical contents in different tissues of fish due to toxic effects of different heavy metals and pesticides have been reported by number of workers (Aliaa M et al. 2011). Under this research and scientific and systematic attempt has been made to study the detrimental effect of Rogorin on biochemical changes in the Gill of

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fresh water Cat fish Clarias batrachus in laboratory experimental.

II. MATERIALS AND METHODS

Accordingly for the purpose of study of effect of pesticide induced polluted water on the fresh water fish clarias batrachus, suitable scientific experimentations were carried out to study the effect of rogorin on gills of the catfish Mangur. Mangur's head is covered over by a thick tissue composed of mucus glands, taste buds, and connective tissue under which Gill head is located which contains bony part of gill arch and gill rackers. The surface epithelium of gill arch showing parallel arrangement of epithelial cells having mucus pores. Examination of thin sections of gill arch of Clarias batrachus (Control) showing four pairs of typical teleostean gill arches bearing two rows of primary gill filaments. Each gill filament bears a series of alternately arranged semicircular secondary lamellae on both sides (Photo Plate No. 1 Photo No. 1-4). The surface of gill lamella is lined by a thin layer of simple squamous epithelium which rests on basement membrane covering the pillar Cell-blood channel system and which constitutes the main vascular area of the gills. Gills of Clarias batrachus exposed to Rogorin exhibited varying degree of damage in sublethal concentration (0.004 ppm) after 48 h. Mucus cell hyperplasia was generally more pronounced towards the proximal end of the filament. After 96h of exposure, hyperplasia of epithelial cells resulted in the fusion of many lamellae. In 0.008 ppm and 0.001 ppm exposure up to 96 h ”and become enlarged. Some lamellae appeared thickened and retracted while some were reduced and subepithelial space developed. After 96 h of exposure, in 0.004 ppm (sublethal concentration), buldging of taste bud gill racker, formation of interlamellar space, fusion of secondary lamellae, breakage of lamellar blood capillaries, swollen tip, telangiectatic secondary lamellae and clotting of blood were observed.

III. RESULT & DISCUSSION :

Gills have an extensive surface area and minimal diffusion distance between dissolved O2 and blood capillaries for efficient gaseous exchange. However, fish gills are marvellously equipped with a defence mechanism working against the environmental irritants which essentially is the mucus cell. The mucus cells react instantaneously to the pollutants and secrete copious mucus to form a thick protective layer over the entire exposed surface, which remain stuck to the mucus. The mucus layer creates a microenvironment that may act as an ion trap, concentrating trace elements in the water. The histomorphological response of the gills of fish exposed to ambient insecticides (including metal salts) is often manifested by a prominent increase in the density of its mucus cells Ganeshwade et al. (2012). The large amount of mucous secretion acts as a defence mechanism against several toxic substances Bhatnagar et al. (2007). The regular elimination of mucous layer from the gill surface into aquatic media helps to remove the bound pathogens, toxicants and foreign matters which remain stick to the gills Prashanth et al. (2011), Pandey et al. (2014) .

Table No. 8: Biochemical contents in the gills of Clarias batrachus to rogorin toxicity exposure for 96 hrs.

Biochemical parameters	Control (mg/100mg wet tissue)	After 96 hours (mg/100mg wet tissue)
Carbohydrate	5.13 ± 0.11	3.12 ± 0.17
Protein	35.33 ± 0.29	16.86 ± 0.52
Lipid	4.12 ± 0.31	2.28 ± 0.11
Free Amino Acid	5.61 ± 0.37	9.84 ± 0.37

In control, Gill exhibited normal structural arrangement and ultration were observe tissue in the tissue of rogorin treated catfish. The perusal of the data and the figure clearly indicate that in the Gill tissue a lethal concentration of rogorin hitological ultration such as congestion, shortened swelling lamellae, lifting of lamellar epithelium and brodaned secondary lamellae and the mucus deposition of the Gills were found. As Gill is an important organs of resporation and has direct contact with water, which allows the rogorin pesticide to enter through and get accommolated in the fish body. Thereby disturbing tissue system. Similar result were found by other researcher also

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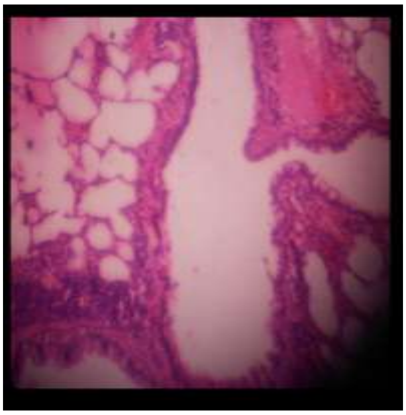
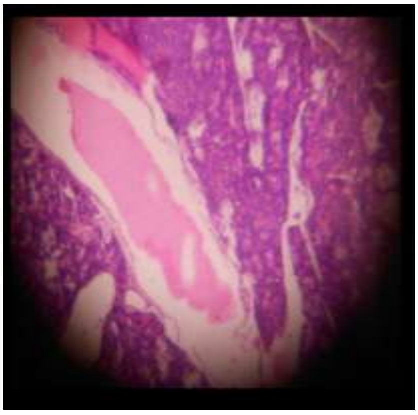
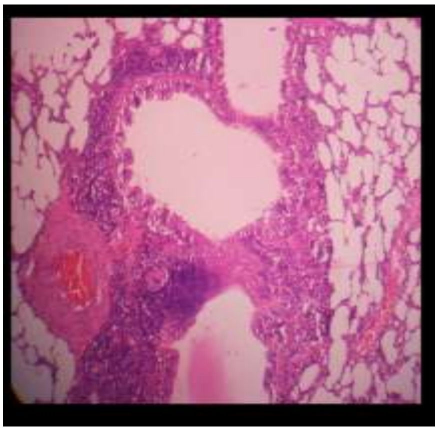
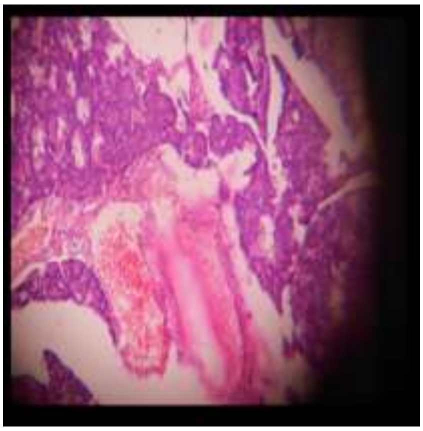
who stated that the increase of mucus deposition on the gills and damage caused to gill lamellae by the toxicant would reduce gaseous exchange (De Silva et al., 2002, Al-Ghanim et al., 2008).

Photo Plate 1: Changes in Gill after exposure to rogorin treated water for 96 hrs.

 Photo 1 Rogorin treated structural organization of gill with gill lamella, taste bud and gill arch. H/E 100X.	 Photo 2 Gill of control fish showing mucous Cell, blood channel and epithelial cell. H/E 400X.
 Photo 3 Rogorin treated gill showing hyperplasia of Epithelial lining the secondary lamella. H/E 150X.	 Photo 4 Rogorin treated gill fusion and hyperplasia along with enlarged mucous cell of secondary lamella. H/E 520X.

Bhatnagar et al. (2007) noticed that the gill microenvironment differs considerably from that of the surrounding body and water causing deposition of metals on the gill surface Deshpande et al. (2011) . Due to copper sulphate intoxication the gill epithelium was completely separated from the basement membrane and pillar cells and there was a swelling of the secondary lamellae and dilation of the vessels. The pillar cell nucleus showed necrosis and vacuolation in the secondary gill epithelium. The disorganised fusion in secondary gill epithelium was prominently observed after exposure of the toxicants. Histopathological change in the gill of Labeo rohita was reported by Velmurugan et al. (2009) after exposure of the fish to organophosphate pesticide monocrotophos. According to their investigation epithelial proliferation, congestion of blood vessel and hyperplasia of mucus cells was reported in the gills.

The similar changes were also observed by Chandra et al. (2008). The structural alterations in the gill morphology had been categorised by Jawale (2016) into two groups: (1) the insecticides causing necrosis and rupture of the branchial epithelium. These changes are dose dependent and

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often reported under lethal conditions. The death of branchial cells and their rupture usually develops either by autolysis or by rapid lysis caused by the direct action of toxicants on the cells' constituents and (2) branchial defence response achieved by mucus hypersecretion, epithelial lifting, swelling, hyperplasia and lamellar fusion. It is well established that secondary gill lamellae play an important role in the transport of respiratory gases. The damage done to the lamellae might have reduced the O2 transport which in turn would have influence the metabolic system of the fish. The accumulation of the pesticide on gill imitated the elevation of mucus secretion and decreased ventilation which ultimately decreased the O2 uptake through gills. The results observed in the present study are in accordance with the findings of Bhatnagar et al. (2006) and Camargo et al. (2007).

IV. CONCLUSION :

The output of the present investigation indicated that LC_{50} value of Clarias batrachus subjected to Rogorin poluted water was vary low because this fishes highly sensetive to pesticide pollution. The study also revealed that alteration of histological status of the Rogorn treated fishes have severe alteration and detrimental effect. Thereby raising alarm for judicious use of pesticide in crops adjecent to waterbodies and protect the fishes from exposure to pesticide polluted water.

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