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Toxic Effect of Root Extracts of Balanitesaegyptiaca on Liver of Fresh Water Fish Catlacatla

Rahul R. Kajalkar[1], Sharda N. Padghane[1]

[1]Department of Zoology, M.S.P. Arts, Science & K.P.T. Commerce College, Manora, Dist. Washim, Maharashtra, India

ABSTRACT

The study examined the toxic effect of root extract of *Balanitesaegyptiaca*on fresh water fish *Catlacatla*. The corresponding effect of this plant extract on health status of the *Catlacatla* were similarly studied using their histopathological profiles.The experiment is carried out at the research laboratory of J. D. PatilSanglutkarmahavidyalaya, Daryapur Dist. Amravati (M.S.). Fish were acclimatized for one week and fed twice daily at the rate of 2% body weight. Water in tank was replenished daily. Total of 10 fish of *CatlaCatla* were exposed to concentration of 09.00 mg/l13.00 mg/l13.00 mg/l root extract of *Balanitesaegyptiaca* set up in three replicates. Histology of liver showed variations in distortion and damages to the tissue; with observed severity increasing with increase in extract concentrations. This study suggested that the 96-h LC_{50} of *Balanitesaegyptiaca* could be greater than 5 g L^{-1}. The study concluded that caution must be taken in the disposal of this plant in water bodies as extended exposure time and at higher concentrations could pose adverse effect on the fish *Catlacatla*.

Key words: toxicity, *Balanitesaegyptiaca*, *Catlacatla*, histopathalogy

I. INTRODUCTION

The purpose of the acute-lethal toxicity is to determine lethal toxic effect of a toxicant within a short duration of usually 96 hours or 4 days on a particular tested organism. The acute-lethal toxicity test with fish species is to help in the assessment of possible risk to similar species in natural environments, as an aid in determination of possible water quality criteria for regulatory purposes, and for use in correlation with acute testing of other species for comparative purposes **(USEPA, 2000)**. Acute-lethal toxicity test can be done in the laboratory using static, semi-static and renewable methods as the case may be. In modern toxicology, it is usually advisable for the toxicologist to use the renewable method whereby test solutions are renewed at 48 hours in a 96-hour acute-lethal toxicity test **(Adesina, 2008)**.Test organisms to be used for acute toxicity test must be ecologically important, occupy trophic position leading to humans or other important species, and have adequate background biology, be widely distributed, be genetically stable, have its early stages (larvae, fry, and juveniles) available throughout the year and be sensitive **(Ernest Hodgson, 2004)**.*Catlacatla*(Hamilton) is one of the major fresh water carps native to India, Bangladesh, Myanmar, Nepal, and Pakistan and introduced in many other

countries as exotic species. Because of its high nutritive value, it is a highly priced food fish and of great demand in the market.The Indian major carps *Catlacatla*(Hamilton) was used as the test animal because it is present in almost all freshwater reservoirs in India and is suitable for toxicity monitoring **(Nair, Sherief, 1998)**.Plant extracts are referred to as botanicals and when poisonous to fish is called piscicides**(Burkill, 1985)**.**(Neuwinger, 2004)**. Barbascos of ethnobotanical origin and their application in capturing fish been reported from other regions of the world such as India**(Tiwari and Singh, 2005).** Histological effects of fish poisons on different organs of fish lead to know about the impact of poisons on the ecosystem. The tissues of fresh water fishes show various responses when exposed to toxicants.Some information has been reported on the histological effects of plant piscicidal compounds on fish organs **(Olaifa*et al.*, 2008)**.

II. MATERIAL AND METHOD

Roots of *B. aegyptiaca* are collected from local area near to the Daryapur. After shade drying the plant material was grounded into powder using pestle and mortar. One liter of distilled water was mixed with 200 g of powdered plant material. The mixtures were kept for 2 days in tightly sealed vessels at room temperature and stirred several times daily with a sterile glass rod. This mixture was filtered through muslin cloth. Further extraction of the residue was repeated 3-5 times until a clear colorless supernatant extraction liquid was obtained indicating that no more extraction from the plant material was possible. The extracted liquid was subjected to water bath evaporation to remove the solvent. The water bath temperature was adjusted to 400^0 C. The semi-solid extract produced was kept under a ceiling fan to dry. The extract was weighed and portion of it used for phytochemical screening while the rest was use for the susceptibility test.

The adult specimens of *Catlacatla*were collected from the local market and brought to the laboratory. So for this experiment, fish are acclimatized in glass aquarium for 10 days.The survived fish are maintained in aerated condition and are fed regularly with fish food. The water is replaced every week and replaced with declorinated water. Faecal material and debris, if any, is also removed as and when necessary.

Lethal concentration of 13.00 mg/l was selected for this experiment. Ten fishes were exposed to each concentration. Along with this, appropriate control was maintained for each test. The mortality did not exceed 5% during the test period in control. Survival and mortality percentage were tabulated after 24, 48, 72 and 96 hrs.

For the lethal toxicity test, the fresh water fishes were divided in two groups as follows.

Group I: - Control group of *Catlacatla*

Group II: - Fishes *Catlacatla*were exposed to lethal concentration of root water extract.

To determine structural changes in internal tissues such as liverof both control and exposed fishes of lethal concentration were examined histologically.

III. RESULTS AND DISCUSSION

For lethal concentration at control there are No lesion, no necrosis, no pigments, no malignancy, no inflammation and cellular degradation seen for the 24hrs, 48hrs, 72hrs, and 96hrs.(Plate-1.1).At 9.00mg/l lesion, inflammation occurs on hepatic cell for 24hrs, for 48hrs inflammation and pigments on hepatic cell while for 72hrs necrosis occurs in hepatic cell and inflammation on blood vessels and blood sinusoid and for 96hrs necrosis occurs on hepatic cell while inflammation on blood vessels and blood sinusoid. (Plate-1.2).At

11.00mg/l lesion and inflammation on hepatic cell for 24hrs, for 48hrs lesion, inflammation occurs on hepatic cell and blood vessels while for 72hrs necrosis occurs in hepatic cell and blood sinusoid and inflammation on blood vessels and for 96hrs malignancy and necrosis occurs on hepatic cell and necrosis on blood vessels and blood sinusoid.(Plate-1.3).At 13.00mg/l lesion occurs on hepatic cell and blood vessels for 24hrs, for 48hrs lesion, inflammation on hepatic cell and blood vessels while for 72hrs necrosis, malignancy occurs in hepatic cell and blood sinusoid and for 96hrs necrosis, malignancy and cellular degradation occurs on hepatic cell, blood vessels and blood sinusoid.(Plate-1.4).

Plate-1.1: Liver (Section) of *Catlacatla* exposed to lethal concentration (control) of root water extract of *B.aegyptiaca*.

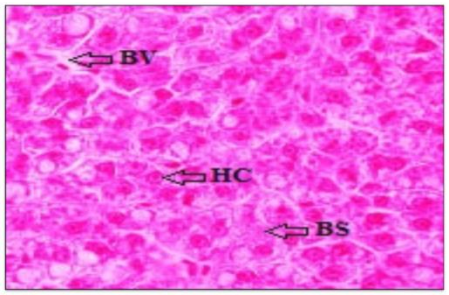


Fig.Liverof*Catlacatla* **(Control).**

HC: Hepatic cell, **BV**: Blood vessels and **BS**: blood sinusoid. No lesion (L), inflammation (I), pigment (P), necrosis (N), malignancy (M) and cellular degeneration (C).

Plate-1.2: Liver (Section) of *Catlacatla* exposed to lethal concentration (9.00 mg/l) of root water extract of *B.aegyptiaca*showing lesion (L), inflammation (I), pigment (P) and necrosis (N).

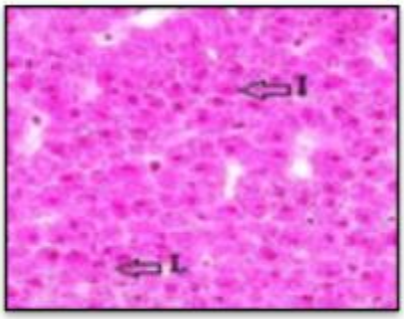


Fig.- 24hrs.

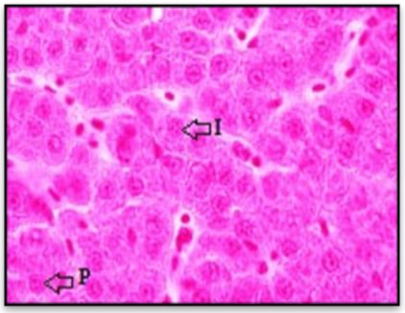


Fig.- 48hrs.

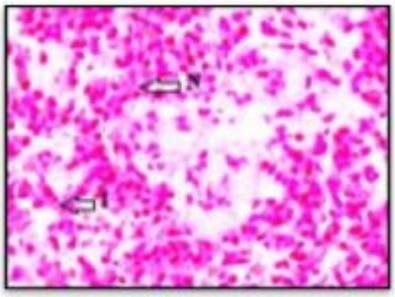


Fig.- 72hrs.

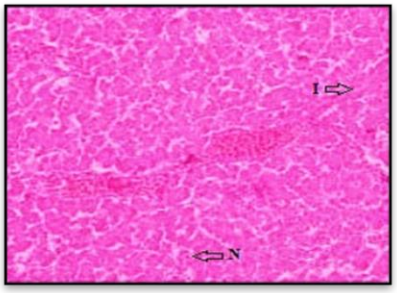
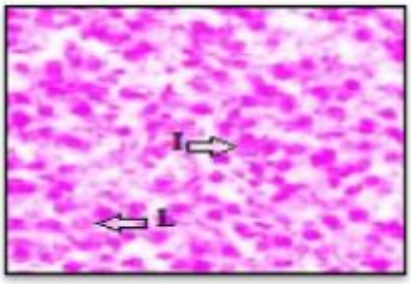


Fig.- 96hrs.

Plate-1.3: Liver (Section) of *Catlacatla* exposed to lethal concentration (11.00 mg/l) of root water extract of *B.aegyptiaca*showing lesion (L), inflammation (I), pigment (P), necrosis (N)and malignancy (M).



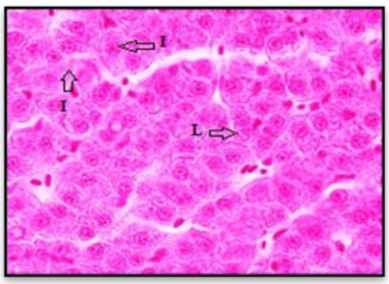
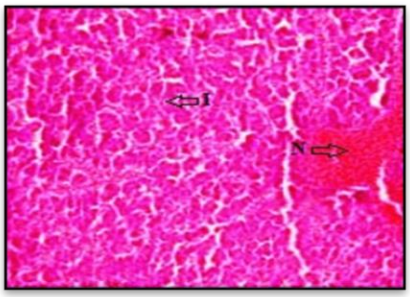


Fig.-24hrs. Fig.- 48hrs.



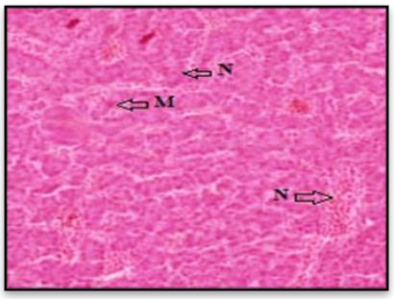
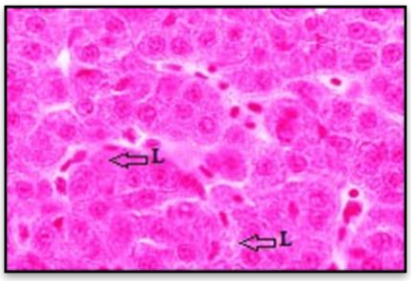


Fig.72hrs. Fig.- 96hrs.

Plate-1.4: Liver (Section) of *Catlacatla* exposed to lethal concentration (13.00 mg/l) of root water extract of *B.aegyptiaca*showing lesion (L), inflammation (I), pigment (P), necrosis (N)malignancy (M)and cellular degeneration (C).



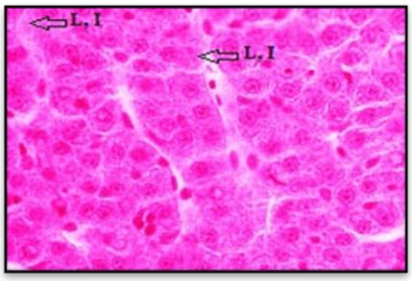
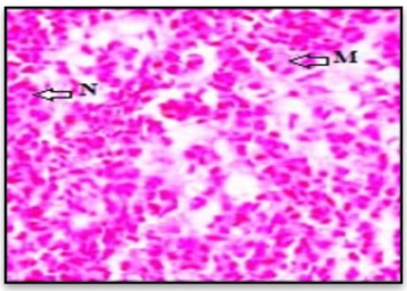


Fig.- 24hrs. Fig.- 48hrs.



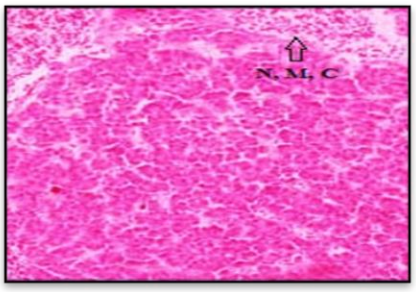


Fig.- 72hrs. Fig.- 96hrs.

The liver of fish exposed lethal concentration for different time exposure (24hrs. 48hrs. 72hrs. and 96hrs.) showed lesion, inflammation, pigment and necrosis of hepatic cell, blood vessels and blood sinusoid during low concentration while, increasing concentration for different time exposure showed necrosis, malignancy and cellular degeneration were seen at later time of exposure(Plate-1.2, 1.2, 1.3, 1.4). Histological biomarkers have

been largely used in fish to identify and evaluate the toxic effects of pollutants exposure **(Oliveira Ribeiro *et al.*, 2006)**. The histological examination of the liver of the exposed fish indicated that the liver were the organs most affected. This observation agrees with the finding of **(Ayoola, 2008)**.In the present investigation, histological effects of root extracts of *B.aegyptiaca* on *Catlacatla* indicated lesion, pigments, inflammation, necrosis, malignancy and cellular degeneration on the liver after exposure. This is agree with **(Fafioye*et al.*, 2004)**reported that aqueous and ethanolicextracts of *Parkiabiglobosa*and *Raphiavinifera*exposedto*Clariasgariepinus*juveniles liver showed disorganized hepatic cords, haemosiderosis, coagulative necrosis andsevere oedema occurred.The liver is considered the most important target organ from a toxicological point of view because of its role in detoxification, biotransformation and excretion of xenobiotics**(Hassanein*et al.*, 1999)**.

IV. CONCLUSION

The present study proves the toxic potential of the plant root extract and shows moderate to severe alterations in liver tissue which can lead to metabolic changes in the fish. The results of the present study clearly indicated that piscicides have a direct impact on the structural alterations in *Catlacatla*. The plant root extract is known to impair the metabolic and the physiological activities of the organism and through repeated exposure the pesticide tends to accumulate in its tissues even at lethal concentration.

The important aspect of this research is, besides the description of the histological effects of the plant root extract on the liver of *Catlacatla,* the detection that some of them are significant and appears very inactive shortly after exposure. One wants to point out that the observed effects are serious if considered that the concentration of the product used in the tests is considered safe according to a perspective of environmental safety.

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