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HISTOLOGICAL ALTERATION OF HERBICIDE GLYPHOSATE ON THE FRESH WATER CRABS *BARYTELPHUSA CUNICULARIS*

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ABSTRACT

Glyphosate (N-phosphonomethyl glycine) is a broad spectrum herbicide and crop desiccant. It is an organophosphorous compound, specially a phosphonate. Herbicides are synthetic compounds having the ability to inhibit the growth of plants or to kill it, espically annual broad leaf weeds and grasses that compete with crops these herbicide without affecting crop plant may get accumulated in it as well as may leached to water through soil unknowingly human beings may get exposed to such chemicals. The purpose of the present study was to examine the glyphosate exposure on histology in various tissues of freshwater crab Barytelphusa Cunicularis. The crabs were exposed to glyphosate round-up, concentration of 0.54 ppm (sub-lethal) for 28 days with the parallel untreated control. The experimental gill tissue exhibited epithelial lifting, edema, necrosis fusion of secondary lamellae and hemorrhage. The vas-deference irregular appearance of spermatophore matrix, reduced spermatophores & epithelial vacuolar degeneration.

INTRODUCTION

The quality and quantity of agricultural production depends on various natural factors like soil quality, water availability as well as damage caused by insects, pests and weed occurrence. Weeds are those unwanted plants or herbs, which grow in field/garden along with crop plants. They compete with crop plants for water and nutrients; some time it has been observed that weeds grow faster than desire plants and affects crop production. Indian agriculture always faced the problem of weeds; hand weeding is traditionally used method but now days due to problem of labors weedicide/ herbicides are used tremendously. Here an attempt has been made to study the effect of Glyphosate on Barytelphusa Cunicularis.

Herbicides are the synthetic chemicals, which kills the target plant by interfering with the growth of the weed and often synthetic "limitation" of plant hormone. Target specific or Selective herbicides are more toxic to some species than to others, while non-specific or non-selective herbicides destroy or prevent plant life in general regardless of species. Depending upon the weed to be controlled variety of herbicides is used. This practice is routinely used in other countries from last 60years. Along with agriculture they are often used in lawns, gardens where children may get exposed. Most of the herbicides have short half-life period ranges from few days to 1-3 months, and therefore they are repeatedly used. Most commonly used are (Glyphosate, Roundup, 2, 4 –D, Atrazine, Pursuit, Paraquat etc.). Glyphosate also known as Roundup, Rodeo and Accord, the major product is Roundup, which consists of their isopropyl amine salt of N- (phosphonomethyl) Glycine and surfactant. The predominant surfactant used is a polyethoxylated tallow amine (POEA), which is a mixture of polyethoxylated long chain alkyl amines (Williams et al., 2000). Roundup, a target specific herbicide, inhibits the shikimic acid pathway, which is important for plant protein synthesis (Schonbrunn et al., 2001). It is a water-soluble and its half-life period >35 day's therefore it has been applied in the field 2 or 3 times, depending upon the growth of weeds. Glyphosate herbicides are among the world's most widely used herbicides (Monsanto, 2002) and the Glyphosate is the world's leading agrochemical (Baylis, 2000). Although Glyphosate herbicide has been popular since they were first marketed in 1974 their use in agriculture has expanded recently with the increased use of crops that have been genetically modified to tolerate Glyphosate treatment (Williams et al., 2000). It is often said that there is no indication of any human health hazard (Washington state uni. 2004). According to Adam (2002) effect of Round-up show respiratory effect, blood stained weeping from noses and diarrhea in rats. In case of chronic exposure many reported carcinogenicity. Farmers in fields repeatedly use Roundup/Glyphosate with the recurrence of weeds. Since herbicides are intended to kill plants, accumulation of herbicides may take place in the soil as well as it may percolate in nearby water bodies. They get fall on crop (which are not weeds) may not killing or destroying but accumulate inside the leaves, grains or fruits, by consuming such product by birds or mammals indirectly or accidentally herbicides enters in body. As the use of herbicides is increasing day by day therefore attempt is made to identify the effect of Glyphosate on Barytelphusa Cunicularis (Male).

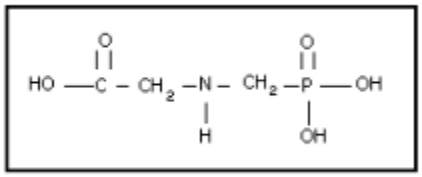
Chemical profile of Roundup

Common name – Glyphosate

Common trade name – Roundup

Molecular formula –C 3 H 8 NO 5 P

Structural formula



MATERIAL AND METHODS

treated as well as control rats.

Chemical name – N (phosphonomethyl) Glycine

Chemical group – Phosphinic acid

The crabs Barytelphusa Cunicularis used in the present investigation for experimental purpose were procured from Paithan region near Aurangabad. They were maintained in the laboratory in the plastic troughs containing tap water. The crabs were fed with prawns & water was changed after every 4hrs. The crabs were kept for acclimatization in the laboratory for 2 to 3 days. Dead animals were discarded only active and moderate size animals were used for experimental purpose. The experimental crabs were not fed one day prior to commencement of experiment in order to avoid the difference if any due to differential feeding. Healthy adult male crab Barytelphusa Cunicularis carapace length between 4 to 6cm individuals were selected for the dissection. Before dissection the crabs were anaesthetized by cold treatment by maintaining them at 4oC for 20-30 mins. The crabs were then weighted using digital balance and carapace length and width were measured. To determine the LC50 the crabs were exposed to glyphosate (Round-up)at 0.54ppm sub lethal concentration of herbicide dose for 28 days. The tissues like gills and vas-deference were collected from.

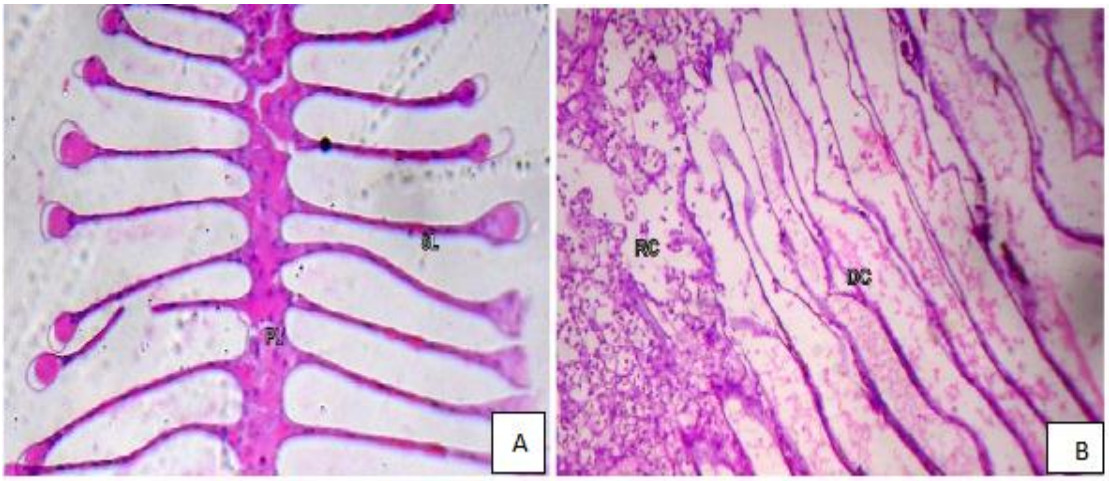
OBSERVATIONS AND RESULTS

Histology of gills

The gills of *Barytelphusa Cunicularis* are formed of a number of lamellae or broad flattened plates arranged serially in pairs along a control gill stem. The central axis is primary gill lamellae and further divides into filaments. The control gill exhibits a thin layer of cuticle which covers the entire outer surface.

Histopathology of Gills

At conc. Of 0.54ppm after 28 days of exposure the changes are hoemocoel filled with coarse amorphous to fibrous materials, massive hemocytic infiltration thickened gill lamellae detached cuticle(DC) and rupture of capillaries. Enlargement and disarrangement of secondary gill lamellae were also observed.

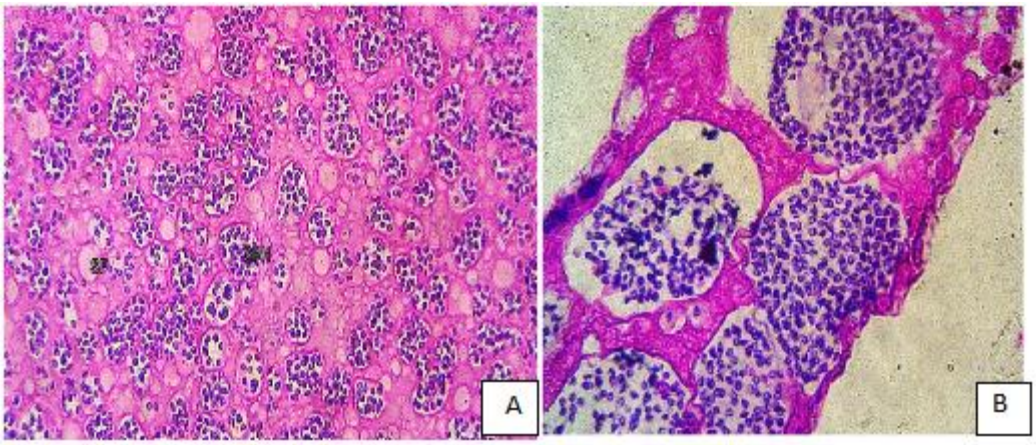


Histology of Vas-deferens

The vas deferens of the control crab shows organized structure of epithelium and spermatophores. It is morphologically coiled and internally lined with squamous epithelium with nucleus and nucleolus. Spermatophore is covered double layered wall. The sperm cells are embedded in the homogenous material referred as spermatophore matrix. The size of spermatophore is from 10 to 70um and it encloses 4 to 80 sperm cells.

Histopathology of vas deferens

At conc. of 0.54ppm after 28 days of exposure there was reduction in the number of spermatophores. Vas deference shows necrosis and atropy. Spermatophore matrix collapsed and spermatozoa exposed out of the spermatophores.



DISCUSSION

The histological change of gills leads to hypoxia, respiratory failure (Alazemi et al 1996). Changes in the architecture of gills under the Round-up glyphosate herbicide, stress would undergo the diffusing capacity of gills with hypoxial condition and thus respiration becomes the problematic task for the crab in the fresh water habitat. Above results suggest that the lethal effect of glyphosate herbicide results in damage to gas exchange mechanism.

The vas-deferens of round-up glyphosate treated crab exhibited disruption in the tubular architecture, reduction in number of spermatophores, disarrangement of epithelial cell & the reduction in the tubular membrane thickness.

Bodkhe(1983) observed irregular arrangement of spermatozoa in the testicular tubules of the crab *Barytelphusa cunicularis* following exposure to sevimol. Jegou(1992) observed the dysfunction which leads to reduction in sperm quality and possible infertility. Fent & Hunn (1995) found that the TBT can also affect sperm count & male reproduction. Zutshi & Murthy (2001) observed appreciable reduction in size, with spermatides & sperms in degenerating conditions &necrosis of interstitial cells after fenthion treatment in the fish *Glossogobius giuris*.

Damage of vas deference as a reproductive organ resulted in the disturbance of overall metabolism & several physiological processes of crab. It can be concluded that widespread use of such herbicides in public places and agriculture fields are to be prohibited or restricted. There is a need to aware the people about the hazardous effects of herbicide.

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