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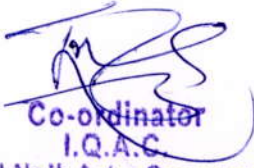
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Effect of Endosulfan on Histopathological Aspect of Land Slug *Laevicaulis alte*

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ABSTRACT: The toxicity of any chemical alters the physiological state of the animal, there by impairing the various metabolic activities. In the present study an attempt has been made to study the effect of one of the tested pesticides, endosulfan, which is found to be most toxic amongst all pesticides on the target organs like mantle, hepatopancreas and foot. Method- Fresh specimens of *Laevicaulis alte* were collected from the cultivated fields in and around Hinganwadi, Pale and Kalwan area of Nashik District and maintained under laboratory conditions in troughs with sufficient amount of moist soil. Slugs were treated with lethal concentration (LC_{50} concentration) of pesticide, endosulfan for 96 hr period during pre-reproductive period. After 96 hr acute toxicity of endosulfan, body parts like mantle, hepatopancreas, foot and belonging to control and experimental groups (LC_{50} concentrations) were removed and taken for histopathological studies and it was observed that there is distortion of organs like mantle, hepatopancreas and foot.

Keywords: Endosulfan, LC_{50} , Histopathological.

INTRODUCTION:

The increasing use of pesticides in order to improve the agricultural productivity to match the explosive population growth rate is a global phenomenon (Srivastava *et al.*, 1987). Incorporation of the toxic compound or their metabolites in lower organisms, as well as in the tissues of fishes, birds and humans have been recorded to cause serious morphological alterations in vital tissues of organisms even at very low levels (Chakraborty and Konar, 1974; Mathur *et al.*, 1981). So the studies on the effects of pesticides on molluscan life are an important aspect of pollution.

The toxicity of any chemical alters the physiological state of the animal, there by impairing the various metabolic activities. However, to have a clear understanding as to how these chemicals cause injury to the tissues, it is essential to have an insight into the histopathological analysis of the tissues. There have been a few studies on the histopathological changes that took place in mantle, hepatopancreas and foot tissues in response to pesticides. There is voluminous literature available on the effect of different pesticides.

Most of the information is available on the nervous system of gastropods that mostly of Pulmonates (Ahirrao *et al.*, 2012). For last two decades different pesticides have been used to get rid of agricultural pests and their applications have greatly helped in increasing the agricultural production. However, none of the pesticides used in the fields are specific in their target and due to the indiscriminate and wide spread use several non-target organisms like fish, snails and crabs along with the hundreds of kind of microorganisms of the aquatic ecosystem are adversely affected. Thus, pesticides have become pollutants of the aquatic system.

Several workers are studying the effects of these pollutants on the body organs of non-target and target species. Effects of organophosphorous pesticides on the liver of carp and catfishes have been studied by Konar (1975). Considerable work has been carried out in *Channa* species in this connection (Dubale and Shah, 1979; Hanumante *et al.*, 1981; Kulshrestha and Arora, 1984). A little work on the crustaceans has also been carried out. Bodkhe (1983) has observed. Thus, there are relatively very few reports on the impact of pesticides on the histopathological changes in molluscs. Most of the work in this connection has been dealt in vertebrates, especially on the fishes. Since little work has been carried out on slugs, except on neurosecretion and reproductive system of *L. alte* (Bodhankar, 1984; Vyawahare, 1988; and Jawalikar, 1989). In the present study an attempt has been made to study the effect of one of the tested pesticides, endosulfan, which is found to be most toxic amongst all pesticides on the target organs like mantle, hepatopancreas, gonad and foot. The studies on effect of the lethal concentration (LC_{50}) of pesticide endosulfan on the neurosecretory cells of the central ganglia such as cerebral, visceral and pedal ganglia have been carried out during pre-reproductive, reproductive and post reproductive period of land slug, *Laevicaulis alte*. The effects of pesticides on the physiology of *Barytelphusa acunicularis*. Rao (1984).

MATERIALS AND METHODS:

Fresh specimens of *Laevicaulis alte* were collected from the cultivated fields in and around Hinganwadi, Pale and Kalwan area of Nashik District and maintained under laboratory conditions in troughs with sufficient amount of moist soil. They were fed once in a day on carrot, potato or mung bean leaves. They were kept in laboratory for three days before subjected to experimentations. Healthy and mature animals of more or less equal size were selected and were starved during experimental period. Slugs were treated with lethal concentration (LC_{50} concentration) of pesticide, endosulfan for 96 hr during pre-reproductive period. After 96 hr acute toxicity of endosulfan, body parts like mantle, hepatopancreas and foot belonging to control and experimental groups (LC_{50} concentrations) were removed and fixed in aqueous Bouin's fluid fixative. The different tissues were then dehydrated in ethyl alcohol, cleared in xylene and embedded in paraffin wax (58-60°C). The sections were cut at 6-7 μ m thickness on a rotary microtome. The sections of mantle, hepatopancreas and foot were stained with Mallory's triple stain. All the observations were made under light microscope to evaluate the changes at cellular level due to pesticide, endosulfan and photomicrographed.

RESULTS:

Histological Changes in Mantle:

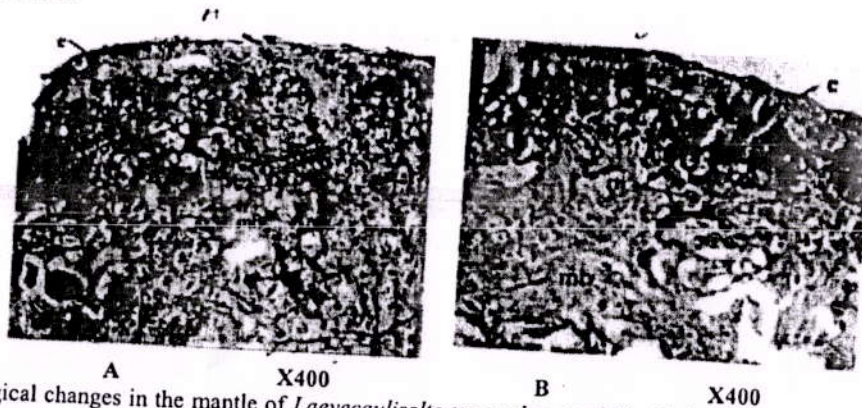


Fig. 1-A-B – Histopathological changes in the mantle of *Laevecaulisalte* exposed to pesticide Endosulfan during pre – reproductive period. A – control ; B – Experimental group (x 100) (ct – connective tissue; e – epidermis ; m – mucocyte; mb – muscle bundles;P – pigment
Control (Figs. 1-A): Its outermost layer is formed of epidermis which is covered by a thin layer of cuticle. Middle layer is formed of connective tissue and the innermost layer is that of muscles. In the mantle mucocytes and pigment cells can be clearly seen.
Endosulfan exposed groups (Fig. 1-B): Cellular destruction of epidermis occurs at certain plates. Slight shrinkage in mucous gland cells has been observed during pre-reproductive period.

Histological changes in hepatopancreas:



Fig. 2-A-B – Histopathological changes in the hepatopancreas of *Laevecaulisalte* exposed to pesticide Endosulfan during pre – reproductive period. A – control ; B – Experimental group (x 100)
 (ct – connective tissue; e – epidermis ; l – lumen; d – digestive cell; ca – calcium cum excretory cell)

Control (Figs.2-A): The hepatopancreas consists of ducts and digestive tubules grouped in the form of bundles connected by inter-lobular connective tissues consisting of collagenous fibers. Each tubule is bounded by this muscle fibers. Each digestive tubule consists of a number of possible cell types. The digestive cells which forms two, three or four interspersed with darkly staining pyramidal cells. The digestive tubules consists of two cell types (1) the digestive cells or columnar type and (2) the secretory cells or pyramidal type. Each of these cells possess a basal nucleus with prominent nucleolus. Large number of amoebocytes are also found in the inter lobular connective tissue.

Endosulfan exposed groups :(Fig-2-B)
 The tubules completely lost their original shape due to dissolution of the basement membrane, which was resulted in disintegration of tubules. These cells mostly showed kariolysis or necrosis. The secretory cells were shrunken and their nuclei were swollen in appearance. The amoebocytes increased in number of inter lobular spaces and many surrounded the tubule cells. The vacuolization was more pronounced.

The above result revealed that the structural changes occurred due to pesticide endosulfan. The dis-connection of digestive and secretory cells with basement membrane, infiltration of amoebocytes in the tubules, vacuolization in the cytoplasm of digestive and secretory cells and kariolysis were the common features of endosulfan acute stress.

Histological changes in foot :

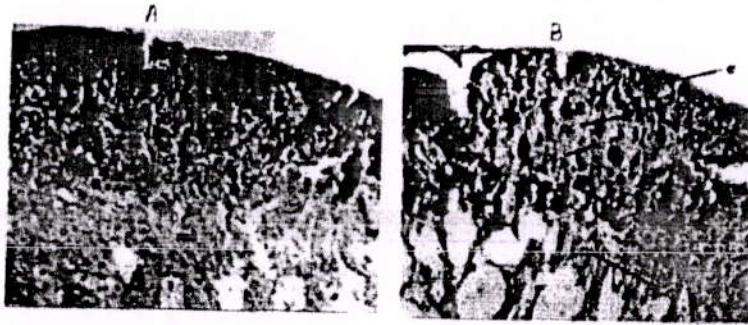


Fig. (5-A-B) – Histopathological changes in the foot of *Laevucaulisalte* exposed to pesticide Endosulfan during pre - reproductive period.
 A – control ; B – Experimental group (x 100)
 (ct – connective tissue; e- epithelium; m- mucocytes; ml – muscles)

Control (Figs. 5-A): Histologically it differs slightly from mantle. Single layered epithelium is present on the foot. Mucocytes are present under the epithelial surface. The connective tissue is thickly packed with transversely running muscle fibres.

Exposed group (Fig- 5-B)
 Slight destruction of the epithelium occurs at certain places. Shrinkage in the mucocytes is resulted (Fig. 5-B). Heavy vacuolization is observed at the junctional zone of mucocytic layer and muscular layer.

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