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INSPECTION OF (TILAPIA NILOTICA) NILE FISH EXPOSED TO ORGANOPHOSPHORUS COMPOUND (DIAZINON)

(With 2 Figures)

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فحص أسماك بلطي النيل المعرضة لتأثير مادة الديازينون

طلعت الختية ، صلاح عفيفي

يهدف هذا البحث الى دراسة الاعراض الاكلينيكية والآفات التشريحية والتغيرات الباثولوجية الناتجة عن التسمم من المبيد الحشري (الديازينون) على أسماك البلطي. ومركب الديازينون يستخدم في كثير من الأغراض لمقاومة الآفات الخارجية للحيوان وكذا استخدامها بطريقة خاطئة في ميد الاسماك. أظهرت الأعراض الاكلينيكية ظهور بعض الحركات العصبية مع احتقان شديد في الأوعية الدموية للخياشيم وفتح الفم باستمرار وفقدان الاتزان وحدوث الوفاة لجميع الاسماك المستخدمة في التجربة بعد ٣٥ دقيقة من تعرضها الى ١% من المركب. وبعمل الصفة التشريحية لوحظ احتقان شديد بالخياشيم (لون أحمر داكن) وبهتان الكبد. وقد أثبتت الدراسات الهتوباثولوجية وجود احتقان شديد بأوعية الخياشيم الدموية. وقد لوحظ أيضاً تغيرات بالخلايا الطلائية للخياشيم تتمثل في التحام طبقات الخياشيم وانفصالها من الغشاء القاعدي وقد أعزى لهذه التغيرات حدوث الوفاة نتيجة للتدخل في ميكانيزم التنفس. كما قام الباحثون بدراسة ومناقشة الآثار السيئة الضارة عند استهلاك الاسماك الملوثة بالمبيد. وفي نفس الوقت أعطيت الارشادات الصحية للكشف عن الاسماك المعرضة للبيع في الأسواق.

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SUMMARY

In the present investigation, twenty fish *Tilapia nilotica* were divided into two groups each containing ten fishes were used. The first group was exposed to 0.01% organophosphorus compound "Diazinon" and the second one was used as control. The obtaining results revealed that the mortality rate was 100% within 35 minutes post exposure. The clinical signs and post mortem finding were recorded. Histopathological observation showed that the gills were the main organ affected. Hyperaemia of the lamellar capillaries and afferent arterioles were evident. Alterations in the gill epithelium were manifested by lifting of the epithelium lining the lamellae and lamellar fusion. The alterations may suggest the direct action of the toxic with subsequent reduced respiration efficiency resulting in an acute death. The effect of pesticide on the human health was discussed.

INTRODUCTION

Recently one of the most deleterious agent to biological life is the environmental pollution. Large scale use of pesticide to prevent losses of cultivated plants and food and food stuff stores has about many problems. When pesticides are used, they are spread out over large areas. They remain more or less stable for a certain time, depending on parameters such as temperature, moisture, sun light and wind. The first three factors contribute to the degradation of pesticide molecules, whereas the flow of air favors evaporation and distant linear transport. Depending on the method of application and the substance used, up to 90% of the pesticide may thus evaporate and enter the environment and the food chain without having had any useful effect (BOEHNKE *et al.*, 1990). The aquatic environmental contamination, including streams, rivers, lakes, estuaries and oceans by pesticides lead to great loss of fishes which are considered as a good source of animal protein and on the same time the consumption of polluted fishes by pesticide can affect adversely the human health.

From public health hazard point of view, any threat to the environment will sooner or later become a threat to the health of the human race. The pesticides reach man and his food in

various ways Fig. 1. Fatal cases of poisoning in the third world are usually not reported. People die e.g. after pesticide contact during application or after consumption of grain treated with fungicides or by eating accidentally contaminated food. In 1987 a publication documented 12,763 cases of poisoning by pesticide residues in food had occurred. The reports came from 22 cases in different countries and 1077 of the reported cases were fatal (FERRER *et al.*, 1987).

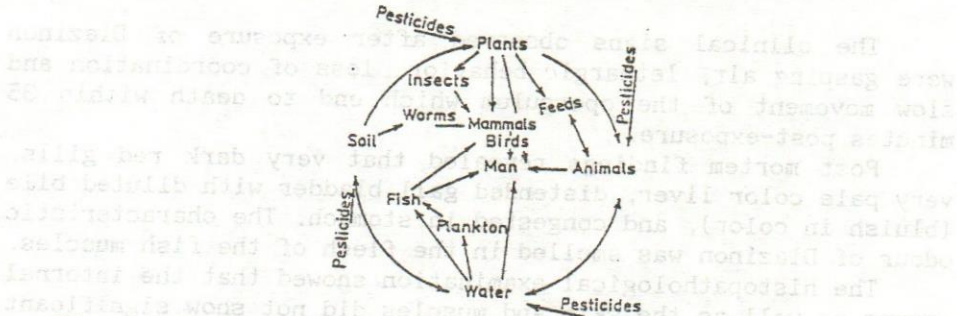


Fig. A: Circulation of pesticides in nature (BARTIK, 1981).

It seems that organophosphates, which do not have a tendency to accumulate, like the organochlorines are responsible mainly for acute intoxications and for most of the fatal cases (HEISE, 1992). Organophosphorus compound (diazinon) is one of the most important toxicant to aquatic life and, consequently consumption of fish lead to hazardous effects. Contamination of the aquatic environment by diazinon occur by air drafts during spraying animals or unhygienic disposal of pesticides, cloths and containers used during this process or through illegal use of such harmful compound during fish catching.

Therefore, the present investigation was planned to study the clinical signs, post mortem findings (for assisting the Veterinarians during the routine inspection of fishes in the markets) and histopathological changes of the toxicity on the fresh water fish (*Tilapia nilotica*) exposed to 0.01% diazinon.

MATERIAL and METHODS

Diazinon was obtained from CIBAGIGY, Switzerland. the commercial name is Neocidol 600 EC.

Twenty fish of (*Tilapia nilotica*) were obtained from El-Ibrahimia canal at Assiut Province. Each fish was of an average weight of 100-200 g. Ten fishes were subjected to 0.01% and ten fishes served as control. The clinical manifestation of intoxicated fishes were observed. The post-mortem examination was carried out for all tested fishes in comparison to control.

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The histopathological examination of the gills, skin, muscles, liver and spleen was made. Samples were taken immediately after death and fixed in 70% Bouin's fixative. Samples were dehydrated, embedded in paraffin and sectioned at 5-7 μ and stained with H&E.

RESULTS

The clinical signs observed after exposure of Diazinon were gasping air, lethargic behavior, loss of coordination and slow movement of the operculum which end to death within 35 minutes post-exposure.

Post mortem findings revealed that very dark red gills, very pale color liver, distended gall bladder with diluted bile (bluish in color), and congested in stomach. The characteristic odour of Diazinon was smelled in the flesh of the fish muscles.

The histopathological examination showed that the internal organs as well as the skin and muscles did not show significant changes from the control group. The gills had marked hyperemia. The afferent arterioles and lamellar capillaries were extremely dilated and engorged with blood (Fig. 1). In all the examined cases, severe lifting of epithelial lining the lamellae was observed. Lamellar fusion was also noticed (Fig. 2).

DISCUSSION

Large-scale use of pesticides has brought about many problems. In this respect thousands of tons of chemical compounds, often very toxic or with other undesirable properties, are in current use. In the last decade, researchers have been increasingly interested in the study of the acute toxicity of pesticides, their accumulation in the animal body, occurrence of residues in food stuffs, and their effects on the human body. The presence of pesticides in food even in a small quantities is considered a potential hazard to human health, which in turn causing a platic anaemia and related blood dyscrasia in bone marrow, cancer, infertility, cytogenic effect, neurotoxicity, induction of liver microsomal enzymes, increased chromosomal damage and effect in immune status NAFADY et al., 1986; DIKSHITH et al., 1989; ABDEL FATTAH, 1992).

From the previously mentioned results, it is evident that by exposing *Tilapia nilotica* experimentally to water containing 0.01% Diazinon the mortality rate was 100% after 35 minutes.

Organophosphates vary greatly in their toxicity ranging from highly toxic preparation through chemicals of medium

toxicity to slightly toxic insecticides and preparations which are only just harmful to health (BARTIK, 1981). This study has shown that the fishes are highly sensitive to Diazinon. To our knowledge no available data concerning the effect of Diazinon on *Tilapia nilotica*. The rapid onset of death due to exposure with Diazinon can be explained by the severe hemorrhagic gills, the lamellar effusion and the epithelial lifting suggesting the direct action of the toxin itself on the gill structures. These changes due to irritation of the toxin might interfere and reduce the respiratory efficiency resulting in acute death. Lifting of branchial epithelium from the gill lamellae is a common alteration induced by irritants (MALLATT, 1985).

The previously recorded results; clinical symptoms, post mortem and histopathological changes revealed the dangerous effect of 0.01% Diazinon on the mortality rate of *Tilapia nilotica*. Therefore, the pollution of aquatic environment by Diazinon or other pesticides constituted a great hazard for both fishes and human consumer.

Generally, to produce animal or fish derived food seems to require a clean environment for the animal and fishes. The light vicinity of animal farms and industrial plant will not be beneficial for the production of clean food. Thus, the application, emission and illegal uses of any material with toxic properties should be generally controled and minimized, in particular in the surroundings of food producing animal or fish places.

In view of the rapidly increasing use of pesticides in developing countries, it is clear that there is a great need for further studies in order to assess properly their public health impact.

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LEGENDS

Fig. 1: Gills of *Tilapia nilotica* exposed to Diazinon. The afferent arteriols are dilated and engorged with blood (C). Hematoxylin and eosin X 25.

Fig. 2: Gills of *Tilapia nilotica* exposed to Diazinon showed epithelial lifting (L) of the lamellar epithelium lining the secondary lamellae. Hematoxylin and eosin X25

