Journal of Wildlife and Ecology (2023). 7(2):57-63

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*Research Paper* **Open Access**

# The Hidden Threat: Investigating the Effects of Triazophos Insecticide on Kidney of Rock Pigeon

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**Citation:** Irshad, A., and T. Hussain. 2023. The Hidden Threat: Investigating the Effects of Triazophos Insecticide on Kidney of Rock Pigeon Journal of Wildlife and Ecology 7(2):57-63.

**SUMMARY**

Triazophos controls a large number of insect pests and mites that damage agricultural, horticultural and forest crops. The main fields of application are cotton, sugarcane, maize, potatoes, vegetables, fruits, coffee and ornamentals. A pesticide should be fatal to the pests, it is intended to control pests but not to unintended species, such as man and wildlife. However, the issue is the use of pesticides in positive and negative ways. As a result, it has been established that the nephrotoxicity seen in birds may be attributed to the deleterious effects of triazophos. Pesticide usage should be done with care, and insecticide-related rules and enforcement should be as effective as possible. In the present study, the induced effects of triazophos have been observed against rock pigeons (*Columba livia*). Three doses of each pesticide (0.5ml, 1ml, and 1.5 ml/kg body weight/day), were applied. The oral treatment was given to each pigeon (pesticide mixed in the water). The mortality rate was noted after 1 day, 7th days and 15 days of treatment. Vacuolar disintegration, sinusoidal space dilation and nephrotic degeneration were also observed in treated pigeons. Due to a reduction in birds' feed and body weight, birds exposed to Triazophos pesticides may have an adverse effect on their essential metabolic organs, such as the liver and kidneys. Exposure to Triazophos may result in considerable weight loss in birds.

**Keywords:** Kidney, Pigeon, Pesticide, Insects

| **Received** in February, 2023 | **Accepted** in May, 2023 |
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## INTRODUCTION

Triazophos is a synthetic organic thiophosphate compound and organophosphate acetylcholinesterase inhibitor that is used as a pesticide, (pesticides are substances that are meant to control pests. This includes herbicide, insecticide, nematicide, molluscicide, piscicide, avicide, rodenticide, bactericide, insect repellent, animal repellent, microbicide, fungicide, and lampricide.) It is characterized as a yellow-brown oily liquid, and exposure occurs by inhalation, ingestion, or contact. Molecular formula of Triazophos is ($C12H16N3O3PS$).

A variety of pesticides are repeatedly applied in our agricultural land and these pesticides can accumulate in their bodies and accumulate in various levels of food chains, one of the primary reasons for the decline in bird populations is due to agriculture (Donald et al., 2001, 2006; Boatman et al., 2007). It accounts for 74% of the endangered species of birds (WWF, 2018). Many animal species that live in natural habitats have been harmed during the last 60 years due to the rapid changes in agricultural techniques that have resulted in an increase in pesticide usage and considerable land conversion for agriculture (Newton, 2004; Boatman et al., 2004; Burns et al., 2016). According to a current North American review, pesticide use is the most prevalent cause of agricultural bird population declines, followed by loss of habitat and change (Stanton et al., 2018). Pesticide usage has also been implicated in declining numbers of agricultural birds. A study on the toxicity of the insecticide (Triazophos) on the kidneys of rock pigeons was conducted. Triazophos insecticide can affect a bird's nephric structure in a modest to severe way. The main objectives of the study were to know the impact of insecticide on behavior and kidney of rock pigeon.

## MATERIALS AND METHODS

### EXPERIMENTAL BIRDS AND DESIGN

The 24 active and mature pigeons (*Columba livia*) were utilized in the study to examine the nephrotoxic effects of the triazophos pesticide. Under normal and controlled laboratory conditions, the birds were kept in well-ordered and fresh wooden wire cages. Before beginning the studies, the pigeons were given a 15-day acclimatization period. The birds were fed a conventional diet of grains and seeds, as well as clean drinking water before being divided into four identical groups (A-D) and contained in separate cages. Prior to the start of the studies, their body weights were recorded. Insecticide treatment groups (B, C, and D) were assigned, whereas in “group A” birds were kept as control (Figure 1).

### INSECTICIDE PREPARATIONS AND THE STUDY PROTOCOL

According to toxicology procedures, the (Triazophos 40EC) insecticide concentration was calculated based on the LD 50. Oral treatment was given to each bird in groups B, C, and D for 15 days at doses of (0.5mL, 1mL, and 1.5 mL/kg body weight/day), whereas birds in group A (control) were given a similar amount of purified water (250ml). Throughout the study, all birds in the handling and control groups received an equal amount of food (jots and kernels) and water daily. Medical and stress-related indications, signs, and social changes in birds of all groups were examined twice daily during the study period. Mild, moderate, and severe were used to categorize them. To compare treatment and control groups, average body weights and feed intake records were obtained (Figure 1).

### ORGAN WEIGHT, MORPHOLOGY AND HISTOLOGICAL PROCEDURE

At the conclusion of the experiment, six birds from each group were slaughtered and dissected at random. The total and comparative weights of the kidneywere recorded after dissections and gross inspections. For the examination of histopathological changes, the taken organs were fixed in Boin’s solution for 24 to 48 hours. For tissue dehydration, a graded sequence of alcohol was utilized, as well as small portions of the kidney embedded in paraplast paraffin wax. On a Rotary microtome, thin tissue slices of 5 to 6 mm were cut and marked with Harris's hematoxylin and Eosin.

OnBest Scope LCD Digital Biological LCD Microscope BLM 260, histological exams, and microphotography were also performed (Figure 1).


Figure 1: Experimental Process.

STATISTICAL ANALYSIS

The data was examined statistically using factorial analysis of variance (ANOVA). Values defined as Mean SD were used to determine significant levels of (P 0.05), (P 0.01), and (P 0.001). Using (The Statistics 8.1) program, the mean difference between groups was examined using the Least Significant Difference (LSD) test.

## RESULTS

Compared to the control group, the overall feed consumption of the treated birds was considerably lower (P 0.05). C and D groups exhibited a significant decrease in feed consumption at day 15 (P1.00), but group B showed a non-significant decrease in feed intake (Table 1).

Compared to the control group, birds in groups B, C, and D showed a non-significant (P 0.001) fall in body weight. Clinical and stress-related symptoms of toxicity were found in birds treated with triazophos within one hour of treatment. This included lethargy; tremors; diarrhea; excessive salivation; seizures; paresis; and drooping of wings. At a larger dosage, birds were not able to walk. But experimenting, six pigeons of group D and six of group C died, while no deaths occurred among birds of the control group throughout the research period (A). The birds in the control group were healthy and active throughout the experiment. When compared to the birds in the treatment groups, they were more alert when it came time to eat, and their consumption of food was greater. The weights of those in groups A and B gradually climbed, whereas those in groups C and D steadily decreased.

While this was not the case for the control birds, they did see a rise in their weight. A substantial (P> 0.05) drop in the average and comparative body weights of handled birds in comparison to those in the control group was seen in this study, which is consistent with prior research findings the experimental group birds (A) eat high food and drink high water than the other group birds (B, C, and D). ANOVA for nutrient digestibility and water intake across groups (P=0.000) although for feed consumption among groups by days (P=1.00), for fluid intake among groups by days (P=0.0905).

Pigeon kidneys in the control group had an average weight of 1.39 mg. In comparison to birds in group A, birds in groups C and D exhibited the greatest drop in the relative and absolute mean weights of the kidney, while birds of group B showed minor changes. The weight of the kidneys of the bird's in-group B decreased less than the bird's in group A, which is the control group (Figure 2).

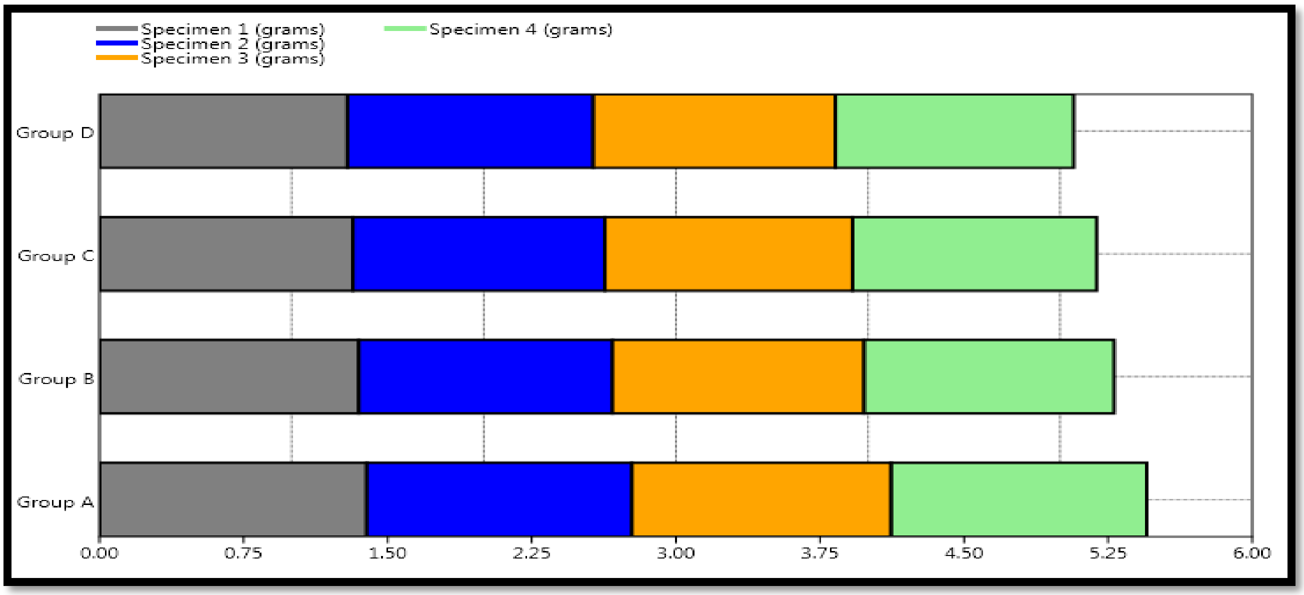


**Figure 2: Average weight of Kidney in various insecticide groups in comparison with control group.**

Due to a reduction in birds' feed and body weight, birds exposed to Triazophos insecticides may have an adverse effect on their essential metabolic organs, such as the liver and kidneys. Exposure to Triazophos may result in considerable weight loss in animals. Compared to groups B and C, the kidney weights of birds in-group D decreased at the greatest rate. Triazophos nephrotoxicity was clearly shown by the decreased weight of treated birds' kidneys. When compared to treated animals, the nephric mass of non-Triazophos-treated animals was normal (Table 2).

Long-term buildup of hazardous chemical compounds may cause nephrotoxicity, which is a frequent clinical symptom. When exposed to triazophos insecticides, birds' kidneys seem pale, bloated, and crumbled under a microscope; in contrast, untreated birds' kidneys appear dark brown and normal under the microscope. The proliferation of the main duct is accompanied by mild to severe nephritic lesions. In addition, Triazophos causes hyperplasia, congestion vacuolar disintegration, dilatation of sinusoid space, and pyknotic nuclei in the lining of the sinus cavities. Birds that had been treated had the same number of histological alterations as those that had not been treated. Some degeneration of nephrocytes was seen in birds belonging to group B, according to microscopic studies. Group C birds, on the other hand, had vacuolations and nephrotic degeneration. Nephrocytes were degraded and nephric hypertrophy and necrosis had occurred in birds in group D as opposed to groups B and C (Figure 3).

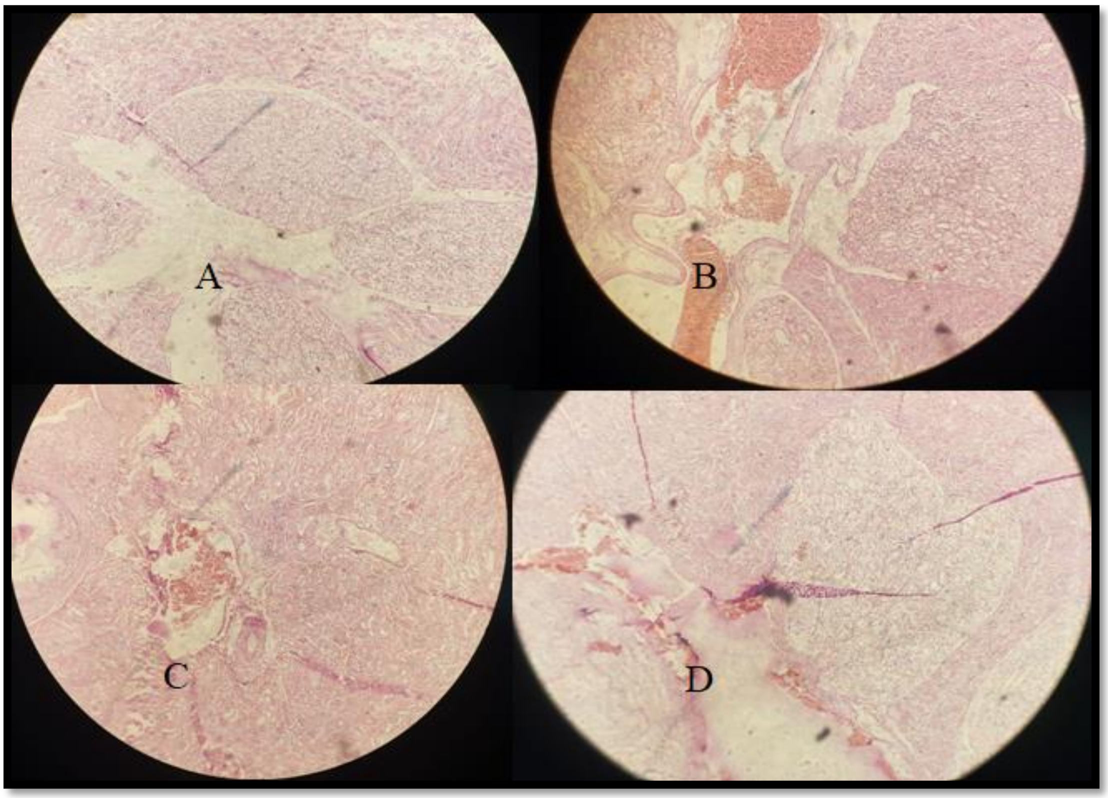


**Figure 3: Impacts of pesticids on the kidney of Rock Pigeon.**

## DISCUSSION

Pesticide tend to become concentrated as they move up to the food chain they accumulate in an organism’s body. The pesticides do not kill the individual birds often but do affect their vital organs like liver, kidneys and heart etc. The indirect effect of pesticides was a major cause of the decline in bird population. Most farmers in underdeveloped nations like Pakistan are uninformed about the dangers of insecticides, and as a result, they routinely apply dangerous insecticides without taking any safety precautions or following any recommended rules or standards at all. Insecticide containers are also dumped in the environment, which harms non-target animals and invertebrates. Higher and sub-chronic dosages of Triazophos have a deleterious effect on avian meal consumption. Frequent salivary flow, panting, drowsiness, convulsions, and frequent feces are just a few of the symptoms that birds exhibit after being exposed to these toxins. Triazophos is rapidly absorbed and metabolized, causing serious damage to the body's metabolic systems. Triazophos inhibits cholinesterase enzyme activity in birds and mammals, affecting the central nervous system and resulting in symptoms such as diarrhea, ptyalism, tremors, paralysis, and other neurological disorders. According to my research, insecticide (Triazophos) has adverse effects on birds, particularly rock pigeons. Toxicology studies have shown that it causes drowsiness, lack of appetite, weight loss and behavioral abnormalities in rock pigeons. A (the control group), B, C, and D were the four groups of birds studied in this research (Treated groups). Triazophoswas combined with water and given to the other three groups, except for A, which received no treatment. A 15-day trial was used. While the weights of birds in groups A, B, and C increased throughout these days, those in group D often lost weight. During the trial, one by one, all of the birds in this group were put to death. Microscopically, several alterations were found, such as enlarged livers and shrinked kidneys, in the birds. The kidneys' nephrocytes were injured when the slices were examined under a microscope, causing harm to the organ as a whole. Because Triazophos (an insecticide) accumulated in the pigeons' essential organs, necrosis set in, and their entire function was wiped off.

**Table 1: Comparison of body weight, water intake and feed intake during trial period.**

| Days | BW(g) | WI(ml) | FI(g) |
|---|---|---|---|
| **1** | 162.96$^{a}$ | 33.608$^{a}$ | 26.175$^{a}$ |
| **2** | 157.79$^{a}$ | 33.350$^{a}$ | 25.925$^{ab}$ |
| **3** | 157.54$^{a}$ | 33.075$^{a}$ | 25.675$^{abc}$ |
| **4** | 160.42$^{a}$ | 32.600$^{a}$ | 25.500$^{abc}$ |
| **5** | 158.92$^{a}$ | 32.900$^{a}$ | 25.375$^{abcd}$ |
| **6** | 157.04$^{a}$ | 33.200$^{a}$ | 25.125$^{abcd}$ |
| **7** | 154.21$^{a}$ | 32.875$^{a}$ | 24.700$^{abcd}$ |
| **8** | 159.79$^{a}$ | 32.800$^{a}$ | 24.575$^{abcd}$ |
| **9** | 158.63$^{a}$ | 32.650$^{a}$ | 24.375$^{abcd}$ |
| **10** | 154.46$^{a}$ | 32.575$^{a}$ | 24.125$^{abcd}$ |
| **11** | 159.08$^{a}$ | 32.475$^{a}$ | 23.925$^{abcd}$ |
| **12** | 160.83$^{a}$ | 32.350$^{a}$ | 23.675$^{bcd}$ |
| **13** | 162.75$^{a}$ | 32.150$^{a}$ | 23.500$^{bcd}$ |
| **14** | 160.00$^{a}$ | 31.750$^{a}$ | 23.300$^{cd}$ |
| **15** | 156.33$^{a}$ | 31.925$^{a}$ | 22.950$^{d}$ |

**Note:** BW (Body weight) is measured in grams (g), WI (Water intake) is measured in milliliters (ml), FI (Food intake) is measured in grams (g).

Cells are founded on the basement membrane, and their nuclei are circular and, in the center, according to the findings of this research. This finding is in keeping with those of several other studies that have looked at the basic cuboidal epithelial tissue that lines the proximal tubule lining (Lafi Batah, 2012). According to the findings of this research, the cells of the simple cuboidal epithelial tissue lining the distal convoluted tubule are anchored to the basement membrane (Lafi Batah, 2012). Many experts have noted that the medulla includes both thin and thick segments of Henle's loop, collecting tubules, and collecting ducts (Ritchison, 2008). Researchers found that simple cuboidal epithelial tissue lined both the thin and thick segments of

Henle's loop, with the cuboidal cells in the thick section appearing thicker than those in the thin segment, and that the nuclei of cells were circular and centrally located, with this finding agreeing with the observations of many other researchers (Baragoth, 2015).

**Table 2: Comparison of body weight, water intake and feed intake between groups.**

| Groups | BW | WI | FI |
|---|---|---|---|
| A | 184.09[a](g) | 39.049[a](ml) | 29.853[a](g) |
| B | 180.12[a](g) | 34.327[b](ml) | 27.513[b](g) |
| C | 149.42[b](g) | 29.853[c](ml) | 22.167[c](g) |
| D | 121.23[c](g) | 27.513[d](ml) | 18.840[d](g) |

**Note:** Body weights (BW) is measured in grams (g), water intake (WI) is measured in milliliters (ml) and Feed intake (FI) is measured in grams (g).

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***Competing interests:*** Authors have declared that no competing interests exist.
***Funding:*** Authors have no source of funding for this work.
***Authors' contributions:*** Authors have designed this project, collected data and written this article; while both authors have critically analyzed this article and approved as final.