Pakistan Veterinary Journal

ISSN: 0253-8318 (PRINT), 2074-7764 (ONLINE)
Accessible at: www.pvj.com.pk

SHORT COMMUNICATION

Clinico-Hematological Disparities Induced by Triazophos (Organophosphate) in Japanese quail

Abdul Ghaffar[1], Sana Ashraf[1], Riaz Hussain[2]*, Tanveer Hussain[3], Maryam Shafique[1], Sobia Noreen[1] and Sana Aslam[1]

[1]Department of Life Sciences; [2]University College of Veterinary and Animal Sciences; [3]Department of Forestry and Wildlife, University College of Agriculture and environmental Sciences, The Islamia University of Bahawalpur, Pakistan
*Corresponding author: driazhussain@yahoo.com

ARTICLE HISTORY (13-406)

Received: September 10, 2013
Revised: October 11, 2013
Accepted: October 23, 2013

Key words:
Clinical signs
Hematology
Quail
Triazophos

A B S T R A C T

The present experimental study was conducted to determine the clinico-hematological changes induced by oral administration of triazophos in male Japanese quail. A total of 60 mature male quail were procured and randomly divided into five equal groups. All the experimental birds received triazophos orally @ 0, 2, 4, 6 and 8 mg/kg/day for 48 days. Birds were killed at day 16, 32 and 48 for collection of blood. Various clinical signs like ruffled feathers, tremors, watery droppings, salivation, torticollis, less foam production, decreased frequency of crowing and mating with their pen mates were observed at high doses (6 and 8 mg/kg/day triazophos). Significantly ($P<0.05$) lowered feed intake and body weight was recorded. Overall significantly ($P<0.05$) decreased total erythrocyte counts, total leukocyte counts, hemoglobin concentration, mean corpuscular hemoglobin concentration while increased pack cell volume and mean corpuscular volume was recorded in treated birds. It was concluded that triazophos induces clinico-hematological changes including anemia (macrocytic hypochromic) at higher doses in birds.

To Cite This Article: Ghaffar A, S Ashraf, R Hussain, T Hussain, M Shafique, S Noreen and S Aslam, 2014. Clinico-hematological disparities induced by triazophos (organophosphate) in Japanese quail. Pak Vet J, 34(2): 257-259.

INTRODUCTION

Pesticides, synthetic organic compounds are introduced to control and eradicate rodents, fungi, insects and weeds (Basir *et al*., 2011; Ahmad *et al*., 2012a, 2012b; Khan *et al*., 2012). Pesticides induce countless abnormalities and shorten the life span of different organisms that are extensively present in agro-ecological zones (Hussain *et al.*, 2011; 2014). Among different pesticides, organophosphate (OP) insecticides are frequently used to control insects (Mitra *et al.*, 2011). Triazophos, broad spectrum OP is abundantly used throughout the world for plant protection (Jain *et al*., 2010). Triazophos is broadly used against different insects, flies and pests that damage variety of cereal crops, vegetables and fruits (Smita *et al*., 2011).

Various studies have shown that OPs are neurotoxic and increase the accumulation of neurotransmitter substances (acetylcholine) in synaptic, neuromuscular and cholinergic junctions resulting in hyper excitability of the parasympathetic receptors ultimately producing muscarinic effects (Mitra *et al.*, 2011). Hematological parameters are best biomarkers to determine oxidative stress and reflect physical and chemical changes in different species exposed to various groups of poisons including insecticides and pesticides (Hussain *et al.*, 2011). Though enough information is available in published literature about the toxicological effects of triazophos in different mammals, however, scanty information is available about its toxic effects on hematology (Kumar *et al.*, 2001) in avian species. Birds have a unique place in agro-ecosystem and represent early warning to environmental problems and threats (Mitra *et al.*, 2011). Therefore, the present experimental was planned and executed to determine the clinico-hematological changes induced by triazophos in adult male Japanese quail (*Coturnix japonica*).

MATERIALS AND METHODS

A total of 60 mature male quail free from any clinical ailment and approximately 4-5 weeks of age were purchased and kept in wire cages for 10 days for acclimatization under similar housing and management conditions. Then randomly divided into five equal groups (A-E) and triazophos (40% technical grade; M/S Pak-China chemicals Lahore, Pakistan) was mixed in clean water and given to birds @ 0, 2, 4, 6 and 8 mg/kg BW by

crop tubes daily for 48 days, respectively. The feed and body weight were measured on daily basis, however, average results were calculated on day 16, 32 and 48 of the experiment.

All the birds were monitored for clinical signs twice daily for 48 days. Four birds from each group were randomly selected and blood samples were collected by cutting the jugular vein on day 16, 32 and 48 of the experiment. Hematological parameters were determined following the standard methods (Hussain *et al.*, 2011). Data thus collected in present experiment were analyzed using analysis of variance (ANOVA). For significant difference between different groups, the means were compared by Tukey's test with $P \leq 0.05$.

RESULTS

Clinical and physical observations: Birds in control group (A) remained healthy, active and did not indicate any clinical picture and rushed at the time of watering and feeding towards feed and water. Quail in group E (8 mg/kg BW) indicated prominent clinical signs including open mouth breathing, ruffled feathers, tremors, dullness, watery droppings, salivation, torticollis, less foam production, decreased frequency of crowing and mating with their pen mates throughout the experiment. Similar moderate clinical signs were observed in group D at day 32 and 48 of the experiment. Mild to very mild degree of these clinical signs was observed in groups B and C at day 32 and 48 of the experiment. The feed intake was significantly reduced in group E throughout the experiment while in group D at day 32 and 48 of the experiment when compared to control birds. The body weight was significantly decreased in groups D-E throughout the experiment when compared to control group (Table 1).

Hematological parameters: The results revealed that the hemoglobin concentration decreased significantly throughout the experiment in groups D-E while in group C at day 48 of the experiment. The total erythrocyte count was significantly reduced in groups D-E throughout the experiment and in group C at day 48 of the experiment (Table 2). The packed cell volume values were significantly increased throughout the experiment in groups D-E and in group C at day 32 and 48 when compared to control group. The mean corpuscular hemoglobin concentration values decreased in groups D-E throughout the present study and in group C at day 48. The mean corpuscular volume values significantly increased in group E at day 16 and in groups D-E at day 32 and in groups C-E 48 of the experiment. The leukocyte counts decreased and heterophil values increased significantly in groups E at day 16 and in groups C-E at days 32 and 48, respectively (Table 2). The lymphocyte values significantly increased throughout the experiment in groups C-E and monocyte values decreased in groups D-E throughout the experiment and in group C at day 48 of the experiment.

Table 1: Feed intake and body weight of Japanese quail administered different levels of triazophos

Parameter/	Groups				
Days	A	B	C	D	E
Feed intake (g)					
16	25.7±0.3	25.0±0.3	23.3±0.5	19.7±0.3	16.9±0.5*
32	26.4±0.7	26.1±0.3	24.7±0.4	19.9±0.5*	16.3±0.6*
48	27.5±0.6	25.7±0.3	23.3±0.4	17.1±0.9*	15.1±0.6*
Body weight (g)					
16	127.4±1.4	126.2±1.1	124.7±0.5	119.6±0.9*	115.6±0.3*
32	30.9±0.7	132.2±0.9	124.4±0.5	120.7±0.3*	113.1±0.7*
48	132.8±0.7	132.6±0.7	126.1±0.3	117.3±0.7*	111.3±0.7*

Triazophos @ 0, 2, 4, 6 and 8 mg/kg was administered to birds of A to E groups, respectively by crop tubing daily for 48 days. Values (mean±SE) in a row bearing asterisk are significantly ($P \leq 0.05$) different from control group.

Table 2: Erythrocyte and leukocyte indices of male Japanese quail administered different levels of triazophos

Parameters/	Groups				
Days	A	B	C	D	E
Hemoglobin (g/dl)					
16	14.5±0.2	13.9±0.3	12.9±0.1	12.2±0.1*	11.9±0.3*
32	14.5±0.3	13.8±0.1	12.8±0.4	11.8±0.2*	11.1±0.4*
48	14.6±0.3	13.9±0.2	12.2±0.09*	11.5±0.3*	10.1±0.1*
Erythrocyte (10^{12}/l)					
16	4.8±0.1	4.6±0.1	4.5±0.05	4.3±0.1*	3.9±0.1*
32	4.8±0.1	4.4±0.1	4.4±0.0	4.2±0.1*	3.4±0.1*
48	4.80±0.1	4.6±0.1	4.3±0.0*	4.1±0.0*	3.8±0.0*
Pack cell volume (%)					
16	31.5±0.2	33.7±0.6	34.1±0.5	39.7±0.6*	42.3±0.5*
32	30.6±0.4	32.6±0.9	37.5±0.9*	38.4±0.7*	41.6±0.9*
48	30.5±0.4	31.9±0.8	37.7±0.9*	38.6±0.5*	44.9±0.4*
Leukocyte counts (10^{9}/l)					
16	34.5±0.5	34.3±0.6	32.9±0.6	32.9±0.2	29.7±0.4*
32	35.9±0.5	33.7±0.4	31.3±0.9*	30.4±0.4*	27.9±0.6*
48	35.4±0.4	33.4±0.5	30.3±0.4*	27.4±0.4*	26.3±0.3*
Heterophil (%)					
16	45.4±1.5	43.9±1.5	44.8±1.8	45.1±0.2	48.7±2.8*
32	44.8±1.6	44.7±1.2	45.6±2.4	45.0±1.9*	50.9±0.8*
48	42.7±1.5	43.5±1.2	47.4±2.2*	47.6±1.1*	49.1±0.5*
Lymphocyte (%)					
16	31.4±1.9	32.3±1.6	35.7±0.6*	39.6±0.9*	36.9±1.1*
32	31.1±0.9	32.3±1.3	37.6±1.2*	37.9±0.7*	36.7±0.9*
48	30.5±1.2	33.4±1.5	41.4±1.4*	34.8±0.5*	36.7±1.1*
Monocyte (%)					
16	6.1±0.3	5.6±0.3	5.1±0.1	4.51±0.1*	4.4±0.2*
32	6.4±0.4	5.5±0.2	5.1±0.2	4.4±0.1*	4.2±0.3*
48	5.7±0.3	5.5±0.1	4.3±0.4*	4.3±0.2*	4.1±0.3*

Triazophos @ 0, 2, 4, 6 and 8 mg/kg was administered to birds of A to E groups, respectively by crop tubing daily for 48 days. Values (mean±SE) in a row bearing asterisk are significantly ($P \leq 0.05$) different from control group.

DISCUSSION

Organophosphorus pesticide poses major risks that damage both the environment and human health. Organophosphorus are abundantly used for mosquito eradication in human health management, to control fruit fly in different vegetables crops and gardens (Mitra *et al.*, 2011). Due to increase selectivity towards insects, moderate environmental persistence, relative less toxicity to mammals, organophosphorus are broadly applied in agriculture which causes different abnormalities in exposed organisms (Naz *et al.*, 2011).

In present study, clinical signs including ruffled feathers, salivation, watery discharge, shivering/tremors, torticollis, decreased crowing and less foam production were observed in quail, which received high level of triazophos. Salivation and shivering/tremors could be due to muscarinic actions of triazophos and watery droppings due to increased gastrointestinal motility (Kumar *et al.*, 2010). These clinical and behavioral signs observed in present study could be due to accumulation of acetylcholine at nerve endings which potentiates

cholinergic toxicity by inhibition of acetylcholinesterase enzyme well known for its muscarinic, nicotinic and central nervous system effects (Kazemi *et al.,* 2012). In present experimental study, significantly decreased feed intake and body weight of quail administered higher level of triazophos were recorded which could be due to toxic effect and taste aversion. No reports are available about the effect of triazophos on feed intake and body weight in birds. The decreased feed and weight could be due to taste aversion and toxic effects of triazophos.

The results of hematological parameters revealed significant decrease in hemoglobin concentration, erythrocyte count, packed cell volume, mean corpuscular hemoglobin concentration and mean corpuscular volume treated quails as compared to control group. From these findings it can be concluded that exposed quails were suffering from anemia (macrocytic hypochromic). The results on erythrocyte indices in present study are similar to Kumar *et al.* (2001) suggesting anemia in triazophos treated broilers. The decrease in hemoglobin concentration can be related to lower feed intake by birds. Decrease total proteins in triazophos treated fish have been reported (Naveed and Janaiah, 2011). The decrease value of hemoglobin could be due to decrease synthesis of hemoglobin or binding of triazophos insecticides to iron leading to decrease size of erythrocyte and lower biosynthesis of heme in bone marrow (Khan *et al*., 2009). The decrease in erythrocyte could also be due to intravascular hemorrhages or increased destruction. The hematological values could be due to decreased production of hemopoietin, reduced erythropoiesis, impaired production of hemopoietic progenitor cells and/or direct RBC lysis (Hussain *et al*., 2012).

The total leukocyte and lymphocyte counts were significantly decreased while heterophils and monocytes were increased at higher doses. Previously decreased total leukocyte count increased heterophil, eosinophil and lymphocyte ratio in broiler birds has been reported (Kumar *et al.,* 2001).

Conclusion: Results of this study revealed that triazophos causes clinico-hematological changes including anemia (macrocytic hypochromic), hematopoietic stress and immuno-suppression at higher levels in birds.

REFERENCES

Ahmad L, A Khan and MZ Khan, 2012. Pyrethroid-induced reproductive toxico-pathology in non-target species. Pak Vet J, 32: 1-9.

Ahmad L, A Khan, MZ Khan, I Hussain, F Mahmood, MK Sleemi, LA Lodhi and I Abdullah, 2012. Toxico-pathological effects of cypermethrin upon male reproductive system in rabbits. Pest Biochem Physiol, 103: 194-201

Basir A, A Khan, R Mustafa, MZ Khan, F Rizvi, F Mahmood and A Yousaf, 2011. Toxicopathological effects of lambda-cyhalothrin in female rabbits (*Oryctolagus cuniculus).* Human Exp Toxicol, 30: 591-602.

Hussain R, F Mahmood, A Khan, MT Javed, S Rehan and T Mehdi, 2012. Cellular and biochemical effects induced by atrazine on blood of male Japanese quail (*Coturnix japonica*). Pest Biochem Physiol, 103: 38-42.

Hussain R, F Mahmood, MZ Khan, A Khan and F Muhammad, 2011. Pathological and genotoxic effects of atrazine in male Japanese quail (*Coturnix japonica*). Ecotoxicology, 20: 1-8.

Hussain R, A Khan, F Mahmood, S Rehan and F Ali, 2014. Clinico-hematological and tissue changes induced by butachlor in male Japanese quail (*Coturnix japonica*). Pestic Biochem Physiol, http://dx.doi.org/10.1016/j.pestbp.2014.01.005

Jain S, S Mythily, RS Ahmad, VK Arora and BD Banerjee, 2010. Induction of oxidative stress and histopathological changes by sub-chronic dose of triazophos. Indian J Biochem Bioph, 47: 388-392.

Kazemi M, AM Tahmasbi, R Valizadeh, AA Naserian, A Soni and MM Moheghi, 2012. Importance and toxicological effects of organophosphorus pesticides: A comprehensive review. Basic Res J Agric Sci, 1: 43-57.

Khan A, HAM Faridi, M Ali, MZ Khan, M Siddique and I Hussain, 2009. Effects of cypermethrin on some clinico-hemato-biochemical and pathological parameters in male dwarf goats (*Capra hircus*). Exp Toxicol Pathol, 61: 151-160.

Khan A, L Ahmad and MZ Khan, 2012. Hemato-biochemical changes induced by pyrethroid insecticides in avian, fish and mammalian species. Int J Agric Biol, 14: 834–842

Kumar J, S Gera, VK Agarwal and B Munish, 2001. Alteration in the haematological profile of triazophos fed broiler chicken. Indian J Poult Sci, 36: 130-133.

Kumar SV, MD Fareedullah, Y Sudhakar, B Venkateswarlu, EA Kumar, 2010. Current review on organophosphorus poisoning. Arch Appl Sci Res, 2: 199-215.

Mitra A, C Chandranath and BM Fatik, 2011. Synthetic chemical pesticides and their effects on birds. Res J Environ Toxicol, doi:10.3923/rjet.2011.

Naveed A and C Janaiah, 2011. Effect of triazophos on protein metabolism in the fish *Channa punctatus* (Bloch). Current Res J Biol Sci, 3: 124-128.

Naz S, SA Rana, M Javed and KU Rehman, 2011. Toxicological effects of brodifacoum and food energy inhibitor on some physiological parameters in house rats (*Rattus rattus*). Pak Vet J, 31: 219-222.

Smita J, RS Ahmed, VK Arora and BD Banerjee, 2011. Biochemical and histopathological studies to assess chronic toxicity of triazophos in blood, liver and brain tissue of rats. Pest Biochem Physiol, 100: 182-186.