

Original Research Article

Effect of Induced Toxicity in Vanraja Birds on Body Weight and Haemato-Biochemical Parameters

Sikandar Yadav^{1*}, Deepak Kumar¹, Kaushal Kumar¹, Sanjiv Kumar¹, Subhash Kumar Das Arya¹, Manikant Sinha², and Sushma Suman¹

¹Department of Veterinary Pathology and ²Department of Animal Nutrition
Bihar Veterinary College, Patna
Bihar Animal Science University, Patna, India-800014

**Corresponding author*

ABSTRACT

The main objective of this research was to observe body weight and haemato-biochemical parameters alteration of induced toxicity in Vanraja birds. For this, 140 day-old vanraja birds procured from Institutional Livestock Farm Complex (ILFC), Bihar Veterinary College (BVC), Patna hatchery and were divided into 4 equal groups consisting of 35 each (GrI, II, III and IV Control). measured in 35 mg, 70 mg and 140 mg and mixed in concentrate feed of birds uniformly and was fed orally to each birds of group1, group 2, group 3 respectively consisting of 35 birds daily after two week of acclimatisation to 4 weeks or until death. Birds of group IV received only normal feed and water, serving as control. Clinical signs of toxicity developed in the treated birds on 21 days and onwards, consisting of partial loss of appetite and body weight, dullness and mild depression from the beginning of the third week. These were followed by gasping, stiffness, difficult breathing, inco-ordination of movement, dry oral mucous membrane with mucous like substances present in the oral cavity in appetance, weakness, progressive loss of body weight, ruffled feather and diarrhoea in all the induced birds. But the intensity of all the clinical manifestations were less in birds in the group I. Clinical signs appear more in group II and group III which was dose and time dependent. Body weights of induced Vanaraja chickens were significantly ($P<0.05$) lowered from 1 week onwards when compared with the control chickens. There was approximately 7.66% body weight loss in 35 mg/kg feed induced birds at 1 weeks than the control birds of the same age. The growth depression effects were 8.25 % the birds with the treatment at 70 mg/kg feed. There was approximately 10.19% body weight loss in 140 g/kg induced birds than the control birds of that age. Haematological changes comprised a significant ($P<0.01$ or $P<0.05$) increase in haemoglobin (Hb), packed cell volume (PCV) and total erythrocyte count (TEC) in induced Vanaraja birds which was dose and time dependent contrast to control birds after 1 to 4 weeks of treatment. Birds of group 3 showed significant changes when compared to the control group 4 birds. A significant ($P<0.01$) increase in total leucocyte count (TLC) with the significant ($P<0.01$ or $P<0.05$) decrease in lymphocyte count and significant increase in heterophils count was also observed in treated birds indicating the suppressive effects of on haemopoietic system. All the treated birds had a significant ($P<0.01$ or $P<0.05$) increase in total serum protein, and a significant ($P<0.01$ or $P<0.05$) increase in serum, uric acid, serum creatinine and serum transaminase activities (AST and ALT) and alkaline phosphatase (ALP) activity on week 1 post-treatment, induced toxicity in Vanaraja birds as there was a marked change in the values of the biochemical indices. The biochemical alterations in the serum indicated a wide range of degenerative and / or necrotic and inflammatory conditions in liver and

Keywords

Toxicity in
Vanraja Birds,
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and
Haemato-
Biochemical

Introduction

Among the several organophosphorus (OP) insecticides, the [CPF: O, O-diethyl-O-(3, 5, 6-trichloro-2-pyridyl) phosphorothioate], a broad spectrum insecticide has gained popularity in veterinary medicine globally.

(CPF) is a white crystalline solid with a strong mercaptan odour Worthing, (1987). It does not mix well in water so it is mixed in oily liquid before application to crops or animals. It may be applied to crops in a micro-encapsulated form. CPF is the active ingredient of various commercial insecticides

Organophosphates (OPs) including Dursban® and Lorsban® (ATSDR, USA, 1997). CPF induces neurotoxicity and tissue damage with observable signs of poisoning. CPF acts on the nervous system of the mammals, birds, fish and many organisms. It acts as acetylcholinesterase (AChE) inhibitor.

Materials and Methods

The study was conducted in Vanraja birds reared at Institutional Livestock Farm Complex (ILFC), Bihar Veterinary College, Patna. Birds were reared for biochemical and haematological examination for which blood samples were collected (Table No: 01).

Experimental birds and their management

Day old Vanraja chicks (140 Nos) weighing about 40-50 gm/chicks were obtained from ILFC hatchery. All the unsexed birds were maintained in heated (35⁰C) metal batteries up to 2 weeks, with chick mash feed and water *ad libitum*, for acclimatization. Then random division of birds into 4 equal groups of 35 each and shifted to non-heated cage

with temperature 29⁰C±3⁰C, to determine the toxicopathological effects of CPF feeding. The vaccination done at 4 days and 28 days with RD-F1 strain and booster respectively.

Feeding of birds (Table No: 02)

Statistical analysis

All the estimated data was analyzed by analysis of variance and the significant results were shown by difference in superscripts with the respective means (Snedecor and Cochran, 1989).

Results and Discussion

1. Clinicopathology

A. Live body weight

Body weights of CPF induced broiler chickens GrI, II, III were significantly (P<0.05) lowered from 3 weeks onwards when compared with the control chickens. No significant change in the body weight of the birds was observed in between the GrI, II, and III at different time intervals.

The reduction in body weight of the birds of the group Gr III were less as compared to the birds of Gr II. Wani *et al.* (2015), also found a significant decrease in body weight and body weight gain in the treated birds (Table No: 3).

B. Haematological studies

Depicted in Table 4(a) and 4(b)

Haemoglobin

There was significant increase (P<0.05) at 1st and 2nd week in all treatment groups. However the difference between Hb

level was found non- significant.

Packed cell volume

The difference was non-significant among all treatment groups at different intervals.

Total Erythrocyte count (TEC)

TEC increase was significantly higher (P<0.05) in group II and III than that of group IV (control) at 4th week of treatment.

Differential Leucocyte count (DLC)

The difference between various treatment group (Table 5 a, b) was significant at 1st, 2nd, 3 rd, and 4th week in all groups.

Total Leucocyte count (TLC)

TLC was found non- significant at 1st and 2nd week among the groups (Table 6). At 3rd week, significant difference was found in treatment groups than in control group (Gr. IV). Birds of group I, II and III were differed (P<0.05) from group IV (control) birds at 4th week.

These results also collaborated with the

findings of Sastry, (1983), Malik *et al.* (2002) and Begum *et al.* (2015).The rise in Hb concentration, PCV and TEC in the present study might be due to the dehydration resulting in diarrhoea and excessive salivation.

C. Biochemical studies

Alanine amino transferase (ALT)

It was evident that CPF toxicity increases in ALT levels (Table: 7). The difference between the different treatment groups was non- significant. At 1st, 2nd and 3rd week non- significant increase (P<0.05) in group I as compared to group IV which is control.

Aspartate amino transferase (AST)

The mean values of AST (IU/L) are presented in (Table: 8). The increase in activity of enzyme was significant (P<0.05) for different treatment level. The increase in level of enzyme was proportional to the treatment level between group II and III; increase was non – significant at 1st, 2nd and 3rd week of exposure.

Table.1 Sample collected from Vanraja/grampriya birds

S. No.	Group	Types of Samples	No. of samples	
1.	Gr I	Blood	EDTA	4
			Non EDTA	4
		Histopathological	4	
2.	Gr II	Blood	EDTA	4
			Non EDTA	4
		Histopathological	4	
3.	Gr III	Blood	EDTA	4
			Non EDTA	4
		Histopathological	4	
4.	Gr IV	Blood	EDTA	4
			Non EDTA	4
		Histopathological	4	
Total = 48				

Table.2 Feeding of birds

Test Group	Feed/ kg feed	Route
Group I	@35mg/ kg feed	Orally
Group II	@70mg/ kg feed	Orally
Group III	@140mg/ kg feed	Orally
Group IV	Normal feed and water	Orally

Table.3 Body weight (g) in control and CPF treated Vanaraja birds

Age in Week (s)	Average body weight (g) of Vanaraja birds (n=20)				Percentage of reduction in growth in birds of Gr. I (%)	Percentage of reduction in growth in birds of Gr. II (%)	Percentage of reduction in growth in birds of Gr. III (%)
	Gr. I	Gr. II	Gr. III	Control Gr. IV			
1	166 ±2.98 ^a	160±3.04 ^b	155±3.514 ^c	176±2.92 ^a	5.68	9.09	12.07
2	280±4.14 ^b	276±4.62 ^b	261±4.85 ^c	292±3.28 ^a	4.10	5.47	10.61
3	622±5.16 ^b	610±5.41 ^b	590±4.61 ^c	659±4.80 ^a	5.61	7.43	10.47
4	951±8.04 ^b	945±7.72 ^b	925±6.62 ^c	1030±5.18 ^a	7.66	8.25	10.19
Age in Week (s)	Average body weight (g) of Vanaraja birds (n=20)				Percentage of reduction in growth in birds of Gr. I (%)	Percentage of reduction in growth in birds of Gr. II (%)	Percentage of reduction in growth in birds of Gr. III (%)
	Gr. I	Gr. II	Gr. III	Control Gr. IV			
1	166 ±2.98 ^a	160±3.04 ^b	155±3.514 ^c	176±2.92 ^a	5.68	9.09	12.07
2	280±4.14 ^b	276±4.62 ^b	261±4.85 ^c	292±3.28 ^a	4.10	5.47	10.61
3	622±5.16 ^b	610±5.41 ^b	590±4.61 ^c	659±4.80 ^a	5.61	7.43	10.47
4	951±8.04 ^b	945±7.72 ^b	925±6.62 ^c	1030±5.18 ^a	7.66	8.25	10.19

*Means in a row having different superscripts differ significantly (P<0.05; P<0.01)

Table.4(a) Hematological changes in control and CPF induced Vanaraja birds at 1st and 2nd week post treatment

Parameters	1 st week				2 nd week			
	Gr. I	Gr. II	Gr. III	Gr. IV	Gr. I	Gr. II	Gr. III	Gr. IV
Hb (g%)	7.20±0.28 ^a	7.36±0.32 ^a	7.52±0.34 ^a	5.98±0.47 ^b	7.38±0.28 ^a	7.54±0.30 ^a	7.64±0.54 ^a	6.08±0.37 ^b
PCV (%)	26.02±1.21	26.50±1.27	26.60±1.02	24.64±1.06	26.52±1.29	27.20±0.98	28.70±1.28	25.14±1.28
TEC (10 ³ /mm) ³	1.74±0.18	2.05±0.15	2.18±0.22	1.67±0.15	1.85±0.13	2.10±0.15	2.16±0.20	1.75±0.21

*Means in a row having different superscripts differ significantly (p<0.05; p<0.01)

Table.4(b) Haematological changes in control and induced Vanaraja birds at 3rd and 4th weeks post treatment

Parameters	3 rd week				4 th week			
	Gr. I	Gr. II	Gr. III	Gr. IV	Gr. I	Gr. II	Gr. III	Gr. IV
Hb (g%)	7.48± 0.43	7.56 ±0.58	7.88± 0.48	6.12± 0.30	7.28± 0.42	7.60± 0.57	8.12± 0.30	6.48± 0.33
PCV (%)	27.66± 1.22	28.40± 1.07	29.50± 1.94	25.38± 1.02	28.20± 0.96	28.60± 1.57	29.84± 1.93	26.26± 1.14
TEC (10 ³ /mm ³)	1.77± 0.18	2.24± 0.17	2.34± 0.18	1.78± 0.20	1.90± 0.26	2.26± 0.23	2.40± 0.30	1.84± 0.25

*Means in a row having different superscripts differ significantly (p<0.05; p<0.01)

Table.5(a) DLC of control and CPF treated birds

Parameters (%)	1st week				2 nd week			
	Gr. I	Gr. II	Gr. III	Gr. IV	Gr. I	Gr. II	Gr. III	Gr. IV
Lymphocytes (%)	60.54±1.80 ^b	60.20 ±1.71 ^b	58.50 ±1.67 ^b	66.94 ±1.84 ^a	59.6 ±1.69 ^b	57.10 ±1.38 ^b	56.40 ±1.20 ^b	66.50 ±1.61 ^a
Heterophils (%)	29.20 ±1.50 ^a	30.50 ±1.24 ^a	33.20 ±1.40 ^a	23.58 ±1.63 ^b	28.60±1.63 ^b	32.20±1.40 ^a	33.50 ±1.28 ^a	25.20±1.65 ^c
Monocytes (%)	6.10 ±0.45	4.80 ±0.35	5.10 ±0.39	5.84 ±0.22	6.12 ±0.40	5.50 ±0.25	6.0 ±0.33	4.40 ±0.20
Eosinophils (%)	3.0 ±0.57	3.40 ±0.48	2.40 ±0.53	2.64 ±0.35	4.50 ±0.42	4.30 ±0.27	3.28 ±0.32	2.85 ±0.35
Basophils (%)	1.16 ±0.26	1.10 ±0.28	0.80 ±0.14	1.20 ±0.25	1.20 ±0.24	0.90 ±0.18	0.82 ±0.16	1.05 ±0.28

*Means in a row having different superscripts differ significantly (P<0.05; P<0.01)

Table.5(b) DLC of control and CPF treated birds

Parameters (%)	3 rd week				4 th week			
	Gr. I	Gr. II	Gr. III	Gr. IV	Gr. I	Gr. II	Gr. III	Gr. IV
Lymphocytes (%)	59.80 ±1.40 ^b	58.50 ±1.40 ^b	56.80 ±1.05 ^b	65.20 ±1.39 ^a	61.40 ±1.65 ^b	60.50±1.60 ^b	56.40 ±1.32 ^c	67.20 ±1.19 ^a
Heterophils (%)	29.60 ±1.16 ^b	32.30 ±1.37 ^{ab}	33.20 ±1.10 ^a	24.60 ±1.07 ^c	28.20 ±1.61 ^b	31.20±1.13 ^b	35.20 ±1.47 ^a	25.30 ±1.13 ^c
Monocytes (%)	6.40 ±0.29	5.40 ±0.37	6.30 ±0.23	6.20 ±0.36	5.30 ±0.27	5.0 ±0.26	4.60 ±0.36	4.40 ±0.20
Eisonophiles (%)	3.60 ±0.37	3.10 ±0.29	2.92 ±0.28	3.12 ±0.30	4.07 ±0.27	2.44 ±0.27	3.22 ±0.30	2.33 ±0.19
Basophiles (%)	0.60 ±0.13	0.70 ±0.08	0.78 ±0.08	0.88 ±0.12	1.03 ±0.14	0.66 ±0.10	0.58 ±0.14	0.97 ±0.17

*Means in a row having different superscripts differ significantly (P<0.05; P<0.01)

Table.6 TLC (10^3 /mm³) in control and CPF treated birds

Weeks post treatment	Gr. I	Gr. II	Gr. III	Gr. IV
1	18.16 ±1.38	19.98 ±1.37	20.88 ±1.38	17.74 ±1.28
2	24.26 ±1.29	25.22± 1.29	26.42± 1.76	22.30 ±1.14
3	30.36 ±1.19 ^a	30.96 ±1.06 ^a	32.60 ±1.07 ^a	26.16 ±1.82 ^b
4	33.14 ±1.70 ^a	33.46 ±1.78 ^a	34.20 ±1.63 ^a	28.16 ±1.41 ^b

*Means in a row having different superscripts differ significantly (P<0.05)

Table.7 ALT (IU/L) of control and CPF treated birds

Weeks post treatment	Gr. I	Gr. II	Gr. III	Gr. IV
1	130.42 ±2.76 ^c	146.20 ±2.87 ^b	169.44 ±3.24 ^a	116.40 ±3.13 ^d
2	136.30 ±2.98 ^c	148.32± 2.30 ^b	164.24 ±3.98 ^a	11.36 ±2.46 ^d
3	138.20 ±2.33 ^b	146.30 ±2.70 ^b	160.16 ±3.49 ^a	125.52 ±2.83 ^c
4	134.60 ±2.13	148.62 ±2.31 ^b	162.20 ±2.38 ^a	115.30 ±2.65 ^d

*Means in a row having different superscripts differ significantly (P<0.05; P<0.01)

Table.8 AST (IU/L) of control and CPF treated birds

Weeks post treatment	Gr. I	Gr. II	Gr. III	Gr. IV
1	6.75 ± 0.62	7.21 ±0.58	8.52±0.71	6.38 ±0.60
2	7.56 ±0.65 ^b	8.50±0.66 ^b	14.26 ± 0.61 ^a	6.10±0.57 ^c
3	8.20 ±0.77 ^b	17.22± 0.93 ^a	16.50 ± 1.16 ^a	6.80±0.55 ^b
4	12.46 ±1.34 ^b	16.24±1.27 ^a	19.28 ± 0.85 ^a	6.20 ± 0.53 ^c

*Means in a row having different superscripts differ significantly (P<0.05; P<0.01)

Table.9 Alkaline Posphatase (iu/l) activity of different group of Vanraja at weekly interval

Weeks post treatment	Gr. I	Gr. II	Gr. III	Gr. IV
1	20.30 ± 0.88	20.40 ± 0.95	21.80 ± 1.01	18.50 ± 0.86
2	21.54 ± 0.94	22.58 ± 1.11	23.60 ± 1.20	20.36 ± 0.85
3	23.72 ± 1.17 ^c	26.60 ± 1.10 ^b	32.10 ± 1.28 ^a	22.40 ± 1.02 ^c
4	25.44 ± 1.10 ^b	29.40 ± 1.32 ^b	34.32 ± 1.67 ^a	21.40 ± 1.04 ^c

*Means in a row having different superscripts differ significantly (P<0.05; P<0.01)

Table.10 Total protein (g/dl) of control and CPF treated birds

Weeks post treatment	Gr. I	Gr. II	Gr. III	Gr. IV
1	5.10 ±0.32 ^a	5.12±0.28 ^a	5.03± 0.39 ^a	3.60 ±0.24 ^b
2	5.20± 0.33 ^a	5.24± 0.29 ^a	5.32± 0.37 ^a	3.72±0.26 ^b
3	5.30 ±0.36 ^a	5.36± 0.34 ^a	5.40 ±0.40 ^a	3.91± 0.39 ^b
4	5.18 ±0.30 ^a	5.21 ±0.36 ^a	5.74± 0.46 ^a	3.68± 0.30 ^b

*Means in a row having different superscripts differ significantly (P<0.05; P<0.01)

Table.11 Uric Acid (mg/dl) of different group of Vanraja at weekly interval

Weeks post treatment	Gr. I	Gr. II	Gr. III	Gr. IV
1	135.36±4.92	138.4±4.74	156.60±4.70	125.38 ± 5.0
2	142.64±5.39	118.62±5.24	160.62±5.86	128.56±5.80
3	158.66±5.72 ^b	170.80±6.46 ^a	176.92±6.12 ^a	106.48±3.52 ^c
4	154.76±4.97 ^b	157.58±5.66 ^b	180.70±6.28 ^a	112.54±4.09 ^c

*Means in a row having different superscripts differ significantly (P<0.05; P<0.01)

Alkaline phosphatase

The mean values of serum alkaline phosphatase (IU/L) are presented in the (Table: 9). Administration caused increase in serum alkaline phosphatases. The increase was non – significant at 1st and 2nd week of treatment. At 4th week, the increase was in proportion to the dose and time dependent. There was significant increase (P<0.05) in Alkaline phosphatase for all treatment group compared to control (Gr IV).

Total serum protein

The total protein values expressed as g/dl are represented in (Table: 10). The mean value of total serum protein showed significant (P<0.05) increase in the treated group as compared to control.

Uric acid

Levels of mean uric acid (mg/dl) are presented in (Table: 11). The increase in uric

acid level was more pronounced at higher dose level. For the 1st two week of treatment, the increase was non-significant.

Ahmad *et al.*, (2015) found increased activities of ALT and AST (P≤0.05) in CPF treated birds which was time and dose dependent. Kammon *et al.* (2010b) also found the activities of liver function enzymes viz. Alkaline phosphatase, ALT and AST were significantly increased in CPF induced chickens. Also Uric acid and glucose level was significantly increased.

The biochemical alteration in the serum indicated a wide range of degenerative or necrotic and inflammatory condition in parenchymatous organs, particularly in liver and kidneys in the CPF treated birds.

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