VOL.1, NO.1, JULY 2006 ISSN 1990-6145
Journal of Agricultural and Biological Science

www.arpnjournals.com

EFFECT OF DIFFERENT LEVELS OF CHROME SHAVINGS ON HEMATOLOGICAL PARAMETERS IN THE BLOOD OF QUAIL CHICKS

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ABSTRACT

The present study was carried out to investigate the effects of different levels of tannery wastes or chrome shaving on hematological parameters of quail chicks. The chrome shaving was replaced by animal protein with 2.5 % and 5 % level and administrated to chicks in feed. The study was carried out up to 9th week of quail chicks. The blood was taken after each month from test and control quail chicks and studied for Hb (Hemoglobin) contents, TEC (total erythrocyte count), TLC (total leukocyte count) and PVC (packed cell volume). The Hb content, TEC, TLC and PVC were increased significantly in last three months. Increase was high in 5% level of chrome shaving as compared to 2.5 % chrome level. Although, these changes were time and dose dependent.

Keywords: quail chicks, tannery wastes, chrome shaving, hemoglobin, leukocyte, packed cell volume, blood, animal protein.

INTRODUCTION

Tanneries are of great social and economic importance world-wide. Tanneries use different types of processes to tan the leather and tanning with chromium salts are of great environmental concern because of its by-products. Enzymatic processing of chrome shavings has been shown to be a viable treatment for complete solubilization and recovery of chromium and protein chromium tanning is outstanding, both for properties of the resulting leather and for its case and versatility of application. (Eurica et al; 2000).

Tanning is an integral part of the process of converting raw hides and skins into finished leather. Tanning is a complicated and laborious process which can involve over 130 different chemicals depending upon type of raw material used. The chrome tanning method is the most widely used process in Pakistan's leather sector. The presence of toxic compounds, especially compounds of chromium, represents a real danger to the health of population nearby (Tool, 2003).

Chromium tanning is outstanding, both for properties of the resulting leather and for its case and versatility of application. Tanneries use different types of processes to tan the leather and tanning with chromium salts are of great environmental concern because of its by-products. Enzymatic processing of chrome shavings has been shown to be a viable and treatment for complete solubilization and recovery of chromium and protein. A significant amount of chromium was applied in tanning 60% of this is taken up by the leather in this process. The remaining chromium is discharged in the effluent hence the given amount recovery of this metal ions is important due to economic and environmental reasons. There are different methods are used for recovery of chromium, like solvent extraction, precipitation, ion exchange, liquid membranes etc. (Feed International, 2002).

Swiergosz and Kowalska (2000) showed the Cadmium accumulation and its effects in growing pheasants Phasianus colchicus (L.). The aim of the study was to determine Cd accumulation and to assess its effects on tissue structure, levels of Fe in the tissues, and levels of hematocrit and hemoglobin (Hb) in growing pheasants (Phasianus colchicus). The Cd accumulation in the tissues caused decreasing Fe and Hb levels in the tissues. The Fe decrease stimulated hematopoiesis in the liver. Despite this, Hb levels were not kept at normal values.

Quail is widely used as a source of human food in parts of the Orient and it can help in overcoming the animal protein shortage in underdeveloped countries. Quail rearing was introduced commercially for the first time in Pakistan in 1973 – 74. The feed ingredients are similar to those provided to the chickens but the amount are not adjusted to meet the nutritive requirements of this specie, which gives rise to certain problems like cannibalism lowered body weight gain and lowered resistance against diseases like Coccidiosis and Bacillary White Diarrhea. Farmers are facing many difficulties in rearing quails due to non availability of balanced commercial rations, because the requirements of these birds for nutrients are higher as compared to other birds. (Feed International, 2000)

MATERIALS AND METHODS

Five Hundred, one day old Japanese quail specie chicks were purchased from the local hatchery and randomly divided into 3 groups of 100 birds each. These groups were randomly assigned to two

experimental rations in such a way that ultimately there were two groups under each treatment. The experimental rations were fed ad libitum for a period of 9 weeks. Five experimental ratios were prepared containing two levels of chrome shaving partially replaced by animal proteins i.e. 0 %, 2.5 % & 5 % and were designated as A, B & C, respectively. The composition of the experimental rations and the assumed chemical composition of the rations is given in Appendix-A. Assumed chemical composition of the feed ingredients was taken from N.R.C. USA (1969) prepared by P.C.S.I.R Laboratories.

For blood sampling, five animals were selected at random from each group and blood samples were taken out from all animals. About one to 5ml of blood was drawn from Jegular vein with the help of sharp scissor. About half of this blood was placed immediately in Ependorf vials primarily rinsed by heparin (Anticoagulant). This blood was used for hematological studies. The rest of blood was kept in sterilized Ependorf vials for serological studies. The following hematological parameters were selected for present study:

- The hemoglobin (Hb) contents of blood were estimated according to Vankampen and Zijlistra (1961) using commercial Randox Kit.
- The red blood cells (RBCs) and white blood cells (WBCs) were counted according to Dacie and Lewis (1975).
- The packed cell volume (PCV) was recorded by microhematocrit method (Swarup et al., 1986) using model centrifuge.
- The differential leukocyte count was recorded by Dacie and Lewis (1975).

RESULTS

Total hemoglobin (g/dl) in blood of quail at start of experiment was 11g/dl ± 0.02 in control group. In group B it was 8.5 g/dl ± 0.16 and in group C it was 12.5 g/dl!± 0.19. At the end of 9th week hemoglobin value in group A was *13.5 g/dl ± 0.02 (P>0.05) and in group B, it was **13.2g/dl ± 0.17 (P>0.01) while in group C, hemoglobin was ***13.9g/dl ± 0.18 (P>0.001). Hemoglobin decreased at 3rd and 4th week and increased (highly significantly) from 5th to 9th week (Table-1).

Total erythrocytes count in blood of quail at start of experiment was 2.6 ± 0.01 in control group. In group B and C it was same as control value. At the end of 9th week erythrocytes count in group A was 4.1±0.35 and in group B, it was significantly increased as **3.95±0.34 (P>0.01) while in group C, it was ***4.15±0.07 (P>0.001) highly significant. Total erythrocytes count increased highly significantly from 5th to 9th week (Table-2).

Total Leukocyte Count in blood of quail at start of experiment was 4.8±0.2 in control group. In group B it was 4.8±0.01 and in group C it was 4.9±0.01. At the end of 9th week Total Leukocyte Count value in group A was 5.9±0.01 (P>0.05) and in group B, it was **6.1±0.48 (P>0.01) while in group C, Total Leukocyte Count was highly significantly increased***6.2±0.2 (P>0.001).Total Leukocyte Count was increased highly significantly from 5th to 9th week (Table-3).

Packed Cell volume in blood of quail at start of experiment was 28±0.02 in control group. In group B it was 34±0.2 and in group C it was 27±0.02. At the end of 9th week in group A, Packed Cell volume was 43±0.07 (P>0.05) and in group B, it was **39.5±0.01 (P>0.01) while in group C, Packed Cell volume was ***40±0.07 (P>0.001). Packed Cell volume was increased highly significantly from 5th to 9th week (Table-4).

Analysis of results and to draw certain conclusion a statistical test capable of comparing more than one means has to be applied for this purpose. ANOVA, analysis of variance was used. Simple ANOVA was applied to the data. The result was found out to be significant as the value of F was more than. While *P > 0.05, **P > 0.01, ***P>= 0.001, a = Mean ± SEM (Table-3).

DISCUSSION

Blood is the most important tissues, in which changes in metabolic processes are going on, so abnormal alteration in blood parameters are the reliable indicators of toxic effects of drugs, chemicals and diseases. Before the early 1990s, most of the poultry studies had explored the effects of inorganic chromium and were not encouraging. Then American Researchers reported the tendency for 200ppb of chromium picolinate to increase protein percentage and decrease fat %age in 3-week old broiler, chick carcass.

In the present investigation an emphasis was laid in finding out the effects of levels of chrome shaving on various parameters of blood. Total erythrocyte count (TEC), Total leukocyte count (TLC), Hemoglobin contents (Hb) and Packed cell volume (PCV were studied) after the administration of chrome shaving at levels of 2.5 % and 5 % of body weight.

The hemoglobin is the oxygen carrying pigment present in the red blood cells of vertebrates and synthesized in the immature erythrocytes in the bone marrow. The function of hemoglobin is the transport of oxygen from the lungs to the tissues and of Carbon dioxide in the opposite direction and it is also responsible for stabilizing the oxygen pressure in the tissues. The erythrocytes are transporter of hemoglobin. They also contain a large quantity of carbonic anhydrase. All living bodies have a special system for combating the different infectious and toxic agents which is composed of the blood leukocytes and tissue cells derived from the leukocytes. These are the mobile units of the body's protective system. Packed cell volume also called haematocrit, is used to determine the erythrocyte volume fraction. PCV is of diagnostic importance. High

value of PCV indicates polycythemia and low value of PCV indicates anemia (Guyton, 1991).

The present study shows that Hb level, TEC and TLC were increased significantly after 5th, 6th and 7th week administrated chrome shavings in the feed of quail chicks. The present study showed that there was no significantly increase or decrease in packed cell volume. The chrome shaving did not cause the damage to the packed cell volume. The values however were the normal as compared to control group. So there was no significantly result in PCV. The increased in TEC, TLC and Hemoglobin contents were due to increased amount of chromium which accumulated in the body of quail chicks. Chromium caused toxicity and hence increased toxic levels in the body as disturbing the body normal functions. In the present research work, it has been shown that 5% level of chrome shaving gave more significant results as compared to 2.5% level and control.

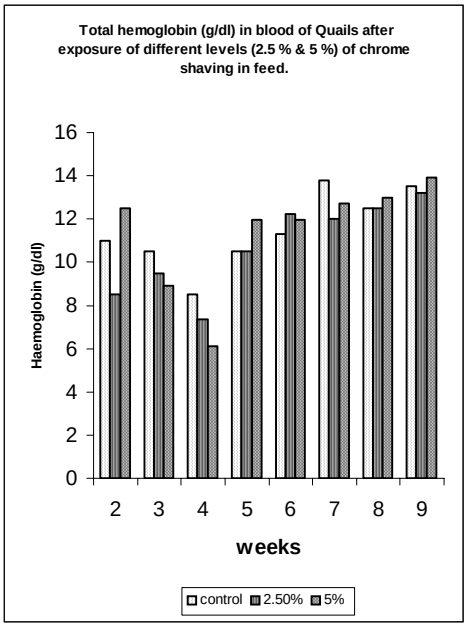

Figure-1. Total hemoglobin estimation.

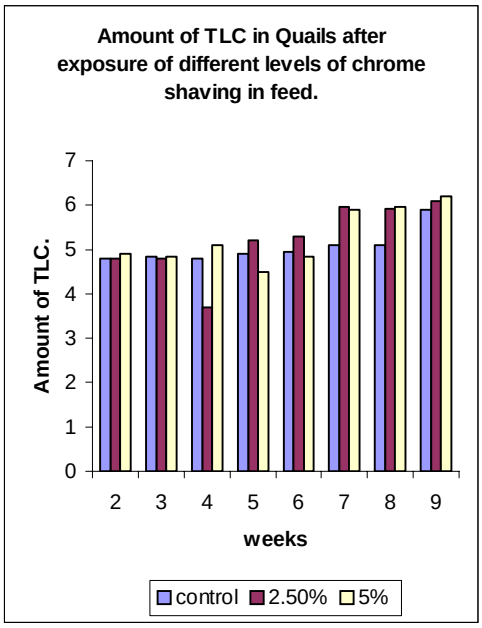

Figure-2. TLC count.

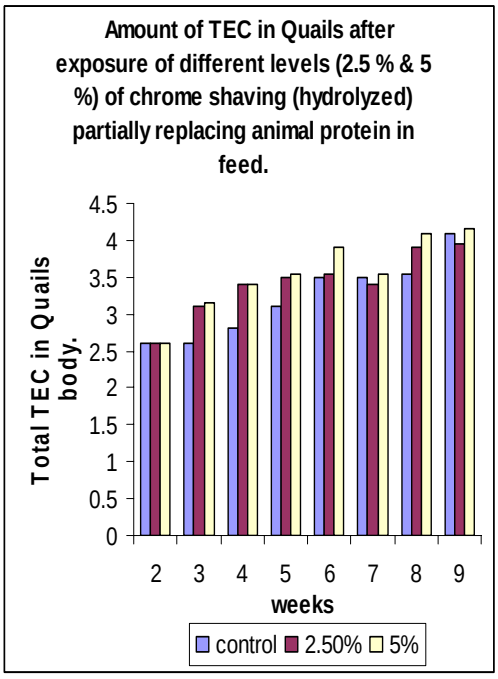

Figure-3. TEC count.

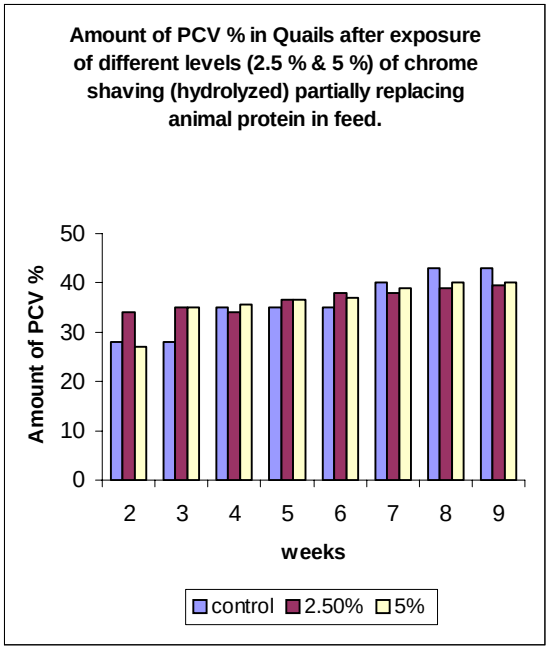

Figure-4. PCV amount.

Table-1. Total hemoglobin (g/dl) in blood of Quails after exposure of different levels (2.5 % and 5 %) of chrome shaving (hydrolyzed) partially replacing animal protein in feed.

	EXPERIMENTAL			DIFFERENCES	
WEEKS	**2.5 %**	**5 %**	**CONTROL**	**2.5 %**	**5 %**
II	8.5±0.16	12.5±0.19	11±0.02	2.5	-1.5
III	9.5±0.24	8.9±0.34	10.5±0.02	1.0	1.6
IV	7.34±0.9	6.125±0.42	8.5±0.028	1.16	2.375
V	10.5±0.14	11.95±0.51	10.5±0.028	0	-1.45
VI	*12.25±0.028	11.97±0.02	11.3±0.001	-0.95	-0.67
VII	*12±0.57	*12.7±0.29	13.8±0.003	1.8	1.1
VIII	*12.5±0.25	**13±0.36	12.5±0.001	0	-0.5
IX	**13.2±0.17	***13.9±0.18	13.5±0.02	0.3	-0.4

Table-2. Amount of TLC in Quails after exposure of different levels (2.5 % and 5 %) of chrome shaving (hydrolyzed) partially replacing animal protein in feed.

	EXPERIMENTAL			DIFFERENCES	
WEEKS	**2.5 %**	**5 %**	**CONTROL**	**2.5 %**	**5 %**
II	4.8±0.01	4.9±0.01	4.8±0.2	0	-0.1
III	4.8±0.2	4.85±0.01	4.85±0.1	0.05	0
IV	3.7±0.2	5.1±0.2	4.8±0.01	-1.1	-0.3
V	5.2±0.28	4.5±0.28	4.9±0.02	-0.3	0.4
VI	5.3±0.01	4.85±0.34	4.95±0.02	-0.35	0.1
VII	*5.97±0.01	*5.9±0.07	5.1±0.2	-0.087	-0.8
VIII	*5.91±0.2	**5.97±0.02	5.1±0.2	-0.81	-0.87
IX	**6.1±0.48	***6.2±0.2	5.9±0.01	-0.2	-1.1

Table-3. Amount of TEC in Quails after exposure of different levels (2.5 % and 5 %) of chrome shaving (hydrolyzed) partially replacing animal protein in feed.

WEEKS	EXPERIMENTAL 2.5 %	EXPERIMENTAL 5 %	CONTROL	DIFFERENCES 2.5 %	DIFFERENCES 5 %
II	2.6±0.2	2.6±0.02	2.6±0.01	0	0
III	3.1±0.28	3.15±0.01	2.6±0.07	-0.5	-0.55
IV	3.4±0.1	3.4±0.02	2.8±0.01	-0.6	-0.6
V	3.5±0.001	3.55±0.28	3.1±0.07	-0.4	-0.45
VI	3.55±0.2	*3.9±0.25	3.5±0.07	-0.05	-0.4
VII	3.4±0.02	*3.55±0.2	3.5±0.07	0.1	-0.05
VIII	*3.9±0.28	**4.1±0.28	3.55±0.28	-0.35	-0.55
IX	**3.95±0.34	***4.15±0.07	4.1±0.35	0.15	-0.05

Table-4. Amount of PCV % in Quails after exposure of different levels (2.5 and 5 %) of chrome shaving (hydrolyzed) partially replacing animal protein in feed.

WEEKS	EXPERIMENTAL 2.5 %	EXPERIMENTAL 5 %	CONTROL	DIFFERENCES 2.5 %	DIFFERENCES 5 %
II	34±0.2	27±0.02	28±0.02	-6.0	1.0
III	35±0.2	35±0.04	28±0.02	-7.0	-7.0
IV	34±0.59	35.67±0.06	35±0.07	1.0	-0.67
V	36.5±0.28	36.5±0.02	35±0..01	-1.5	-1.5
VI	38±.36	37±0.2	35±0.28	-3.0	-4.0
VII	38±0.2	*39±0.25	40±0.25	2.0	1.0
VIII	*39±0.02	**40±0.02	43±0.28	4.0	3.0
IX	**39.5±0.01	***40±0.07	43±0.07	3.5	3.0

*P = 0.05, **P = 0.01, ***P = 0.001, a = Mean ± SEM

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Appendix-A: Composition of experimental feeds (Fish Meal VS H.T.S).

Maize	25	25	25	25	25
Wheat	20	20	20	20	20
Rice broken	5	5	5	5	5
Rice polish	8	8	8	8	8
Cotton seed meal	3	3	3	3	3
Rapeseed meal	7	7	7	7	7
Soybean meal	10	10	10	10	10
Fish meal	16	12	8	4	--
Hydrolysed tannery shaving	--	2.5	5.0	7.5	10
Limestone	1	1	1	1	1
Molasses	3	3	3	3	3
D.C.P	1	1	1	1	1
Vitamin minerals	1	1	1	1	1
Total	**100**	**100**	**100**	**100**	**100**