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The Influence of Chromium Sources on Mortality Percentage in Japanese Quails

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Abstract

An experiment was conducted to study the comparative influence of organic and inorganic chromium on mortality percentage in Japanese quails. A total of 700, day old Japanese quail chicks were randomly divided into seven treatment groups with four replicates consisting of 25 quail chicks in each replicate. Quails were provided with feed supplemented with inorganic chromium, organic chromium in the form of chromium with azolla and chromium with yeast at 500 and 1000 ppb levels and a control diet without chromium supplement from day old to six weeks of age. The incidence of mortality was higher during early stages of life (0-3weeks) rather than later stages (4-6weeks) in all the treatment groups including control. Highest mortality (14 per cent) was observed in control group and lowest mortality (3 per cent) was observed in the treatment group provided with 500 ppb of chromium with azolla.

Keywords: Chromium, Mortality, Azolla, Yeast, Japanese quails.

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INTRODUCTION

Japanese quail farming is gaining momentum in recent years due to shorter generation interval, easy maintenance, early sexual maturity and high rate of egg production. Japanese quails are hardy birds that thrive in small cages and low on maintenance. Quails possess an excellent disease resistance quality than those of chickens and have been chosen for its economical viability in farming (Deka and Borah, 2008). Moreover, the higher economical benefit attracted most of the farmers towards quail farming. The popularity of quail eggs has increased in India due to some belief in its medicinal value. Other advantages of quail farming are minimum requirement of floor space, low investment, early sexual maturity to lay eggs, and high rate of egg production (EP) (Hedayati *et al.,* 2014).

Chromium is an essential nutrient for animals. In recent years, there has been considerable research interest in the utilization of chromium (Cr) in livestock and poultry feeds. The beneficial effects of chromium can be observed more efficiently under environmental, dietary and hormonal stresses. Chromium is an essential element required for carbohydrate, lipid, protein, and nucleic acid metabolisms, activating certain enzymes and stabilizing proteins and nucleic acids. The beneficial effect of chromium in human health is well documented for its role as an integral component of the glucose tolerance factor (GTF) which participates in glucose metabolism by enhancing the effects of insulin (Kroliczewska *et al.,* 2004). Extra supplemental organic Cr in combination with $CrCl_3$ could lead to higher egg production, egg quality, and immune status of breeder quails and their offspring (Gitoee *et al.,* 2017). Supplemental dietary chromium is recommended by (NRC, 1997) for animals undergoing environmental stress. Intake of 50-200 ppb of trivalent chromium is recommended for adult humans (NRC, 1989).

The purpose of this study was to determine the influence of chromium sources on mortality percentage in Japanese Quails.

MATERIALS AND METHODS

Japanese quails for the biological experiment were reared in cages for six weeks to study the mortality percentage. A total of 700, day old Japanese quail chicks were randomly divided into seven treatment groups with four replicates consisting of 25 quail chicks in each replicate. They were fed with different levels of chromium enriched Japanese quail feed from day old to six weeks of age. The experimental treatment groups as follows,

T_1 (Control group) -No chromium supplementation in Japanese quail feed

T_2 Group - Japanese quail feed with chromium enriched azolla (500ppb chromium)

T_3 Group - Japanese quail feed with chromium enriched azolla (1000ppb chromium)

T_4 Group - Japanese quail feed with chromium enriched yeast (500ppb chromium)

T_5 Group - Japanese quail feed with chromium enriched yeast (1000ppb chromium)

T_6 Group - Japanese quail feed with inorganic chromium (500ppb chromium)

T_7 Group - Japanese quail feed with inorganic chromium (1000ppb chromium)

The iso-nitrogenous and iso-calorific experimental diets were prepared at Central Feed Technology Unit, Kattupakkam, Tamilnadu and fed to the birds. Feed formulation of the experimental quail diet is presented in Table 1. The Saccharomyces cerevisiae culture was grown in the laboratory and enriched with chromium. Chromium chloride was used in the culture medium for enriching chromium content in the Saccharomyces cerevisiae culture. The harvested culture was washed thoroughly to remove inorganic chromium and the presence of organic chromium was estimated. The chromium incorporation is directly proportional to the incubation time. Organic chromium content in yeast culture varied from 154 to 226 mg /kg of yeast. The mortality percentage was calculated for each treatment up to six weeks of age. Data collected on various parameters were statistically analysed by one way ANOVA by using SPSS.20. The significance was tested using Duncan multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

The mortality percentage of Japanese quails as influenced by different sources and different levels of chromium is presented in Table 2.

The results indicated that during the experimental period lowest mortality (3 per cent) was recorded in treatment group (T2) provided with 500 ppb of chromium with azolla. Control group (T1) registered the highest mortality (14 per cent) followed by T6 (500 ppb inorganic chromium). Lesser mortality was observed among quails fed with organic chromium than the group provided with inorganic chromium supplemented feed. Higher incidence of mortality was observed during early stages of life (0-3 weeks) rather than later stages (4-6 weeks) in all the treatment groups including control.

Mortality percentage was comparatively less in the treatment group which received 500 ppb of chromium with azolla (T2) followed by T4 group (500 ppb of chromium with yeast). Similar trend was recorded by Debski *et al.* (2004) and Kroliczewska *et al.* (2005) in broilers supplemented with 200 and 300 µg/kg of chromium enriched yeast in the diet respectively. Similarly Jackson *et al.* (2008) also recorded decreased mortality in broilers supplemented with chromium propionate at the level of 200 and 400 ppb in the diet. Further, Kim et al. (1997) also recorded lowest

mortality with supplementation of organic chromium in the diet in case of brown layers.

The mortality percentage during early stages of life might be attributed to the managemental factors irrespective of the treatments. Mortality percentage was increased with increase in the level of chromium in case of organic chromium supplemented groups. This is in contrary to the findings of Kim et al. (1996) who reported reduced mortality with increasing chromium level in the diet of broilers.

The results revealed that in general, the mortality percentage was lower in the organic chromium treated groups than other treatment groups. This is in agreement with the findings of Rajendran et al. (2012) who reported significantly reduced mortality percentage in White Leghorns recovered from Newcastle disease.

Table 1. Feed formulation of the experimental quail diet

Sr.No.	Ingredients	Brooder Mash %	Finisher Mash %
1	Maize	51.5	58.7
2	Deoiled rice bran	4.0	2.0
3	Sunflower oil cake	-	-
4	Soyabean meal	28.0	22.8
5	Fish	10.0	10.0
6	Oil	3.5	3.5
7	Grit		-
8	Mineral mixture	2.0	2.0
9	Salt	1.0	1.0
	Total	100.0	100.0
	Nutrients (per cent)		
1	Crude protein	21.97	19.96
2	Metabolizable energy (k cal)	3030	3100
3	Calcium	1.31	1.29
4	Phosphorus	0.78	0.80

Table 2. Mortality percentage of Japanese quails as influenced by different sources and different levels of chromium

Groups	0-3 weeks		4-6 weeks		Total	
	No. of deaths	Mortality %	No. of deaths	Mortality %	No. of deaths	Mortality %
T1	8	8.00	6	6.66	14	14.00
T2	2	2.00	1	1.02	3	3.00
T3	6	6.00	1	1.06	7	7.00
T4	4	4.00	1	1.04	5	5.00
T5	5	5.00	3	3.26	8	11.00
T6	7	7.00	2	2.15	9	9.00
T7	5	5.00	1	1.05	6	6.00

CONCLUSION

The reduction in the mortality in quails fed with chromium supplemented diet might be due to the beneficial effect of chromium in enhancing the immune system and also due to stress relieving effect of chromium. The decreased mortality caused by the organic chromium supplementation provides economic benefits than just temporarily improved performance of Japanese quails.

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CONFLICT OF INTEREST

The authors declare that no competing interests exist.

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