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Effect of Carbaryl on Hemoglobin and Hematocrit Values of Broiler Chicks

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ABSTRACT

Carbaryl is an insecticide which is widely used in agriculture and in the poultry industry. Carbaryl is used in poultry for their protection against some insects which harms the poultry. This study was conducted to examine the effect of carbaryl on hemoglobin and hematocrit values of broiler chickens. Twenty broiler chickens were used in the experiment and distributed into four different groups. Of these three were treated groups and one control group. All treated groups were supplemented with 15mg/kgbw (Low dose), 20mg/kgbw (Intermediate dose) and 25mg/kgbw (High dose) of carbaryl for 21 days. At the end of the experiment, blood was collected for hematological analysis. Significant depression was found in the level of hemoglobin in intermediate dose group but hematocrit values decrease insignificantly in all the treated groups.

Key words: Carbaryl, Insecticide, Broiler chicks, Hemoglobin, Hematocrit

INTRODUCTION

Carbaryl is an insecticide belonging to carbamate family which kills insects by disrupting the function of their nervous system. It was introduced in 1956 by Union Carbide Corporation. It controls a broad spectrum of insects on more than 120 different crops (Hastings *et al*., 2001). Carbaryl is toxic to birds, fish, bees and other animals. The U.S. Environmental Protection Agency classifies carbaryl as "Likely to be carcinogenic in humans". Carbaryl exposure to men causes sperm problems, including low sperm counts and sperm that cannot move normally. Pesticides are released into the environment and contaminate the air, ground water and also accumulate in the body tissues of animals and humans (Baukloh *et al*., 1985; Foster, 1995; Sonawane, 1995).

The International Agency for Research on Cancer has not designated carbaryl as a carcinogen for humans due to inadequate studies on animals (IARC, 1987). When birds are exposed to carbaryl for an extended period of time, then it may produce fewer eggs, a higher number of cracked eggs and become less fertile (U.S.EPA, 2003). Some of the toxicologists from the University of North Carolina studied that carbaryl has an ability to suppressed the immune system in some laboratory animals (Dong *et al*., 1998).

Various scientists from the Institute of Agricultural Medicine, Poland studied that if carbaryl applied to the skin of laboratory animals then it is deposited in the liver, brain, and blood because carbaryl is absorbed through the skin and accumulates in various tissues and organs (Tos-Luty *et al*., 2001).

MATERIAL AND METHOD

Experimental Animal: Twenty-day-old broiler chicken (Gallus gallus) of weight ranging from 25-30 gm. was used in the experiment.

Experimental Lab: The experiment was conducted in the Laboratory of Reproductive Biology, D.G. College, Kanpur and Animal House of Central Drug Research Institute (CDRI), Lucknow.

Broiler Chicks were kept in conventional condition (open system) and housed in stainless steel cages (800×14cm2) in the animal house with room temperature 22±3˚C, relative humidity 50-70%, period of 12 hrs in Light and 12 hrs in Dark. They were provided with commercial broiler chick starter diet and water adlibitum.

Experimental Procedure: This experiment was conducted to determine the toxic effects of carbaryl on hemoglobin and hematocrit of broiler chicks fed with various levels of carbaryl added to the diet of chickens. Control group was fed on the basal diet (commercial broiler chick starter diet) while all treated groups were supplemented with 15mg/kgb.w (Low dose, LD), 20mg/kgb.w (Intermediate dose, ID), and 25mg/kgb.w. (High dose, HD) of carbaryl for 21 days.

Statistical Analysis: Statistical analyses were performed using STATGRAPHICS 3.0 software. The data were analyzed using one-way ANOVA test. Results were presented as mean±SE. The significance of difference among the groups was assessed using students *t*-test. Significance was set at $P<0.05$, $P<0.01$ and $P<0.001$.

RESULT AND DISCUSSION

Hemoglobin content of control and experimental groups of animals is presented in Table-1, Graph-1a. Statistically significant $p<0.005$ depression was found in the broiler chicks of intermediate dose (20mg/kgbw) of carbaryl but was similar to control in low dose (15mg/kgbw) and high dose (25mg/kgbw) treated broiler chicks. Due to depression in haemoglobin content the birds are anemic. This decrease in the haemoglobin may be due to binding of carbaryl to iron lead to decrease biosynthesis of heme particles in the bone marrow. Contrary to our result in broiler chicks Mansee (1998) reported that there is no has been reported on hemoglobin concentration in rats fed with Cypermethrin but decreased hemoglobin content was found in sheep when treated with cypermethrin (Yousef *et al*., 1998). Similarly, Khan *et al*., (2009) and Sharaf *et al*., (2009) has been reported significant decreased in hemoglobin of goats and broilers respectively, when treated with cypermethrin.

Table-1: Hematological changes (Mean±S.E.) in broiler chicks exposed to different doses of carbaryl (n=5)

Parameters	Control	Low dose	Intermediate dose	High dose
Hb (g/dl)	11.48±0.40	11.4±0.35	9.5±0.58*	11.08±1.13
Hct (%)	32.44±0.65	31.4±1.07	30.42±2.15	31.04±3.21

*Values are mean of three experiments ± SEM with 5 chicks in each group. Those marked with asterisks differ significantly from the control values *P<0.05, **P<0.01, ***P<0.001 (by ANOVA test).*

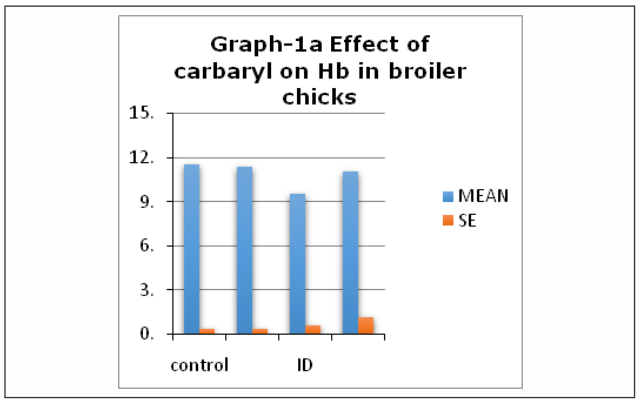
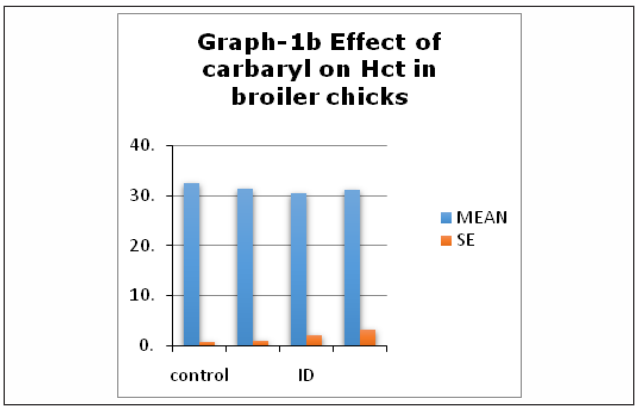


Table-1, Graph-1b demonstrates hematocrit values of control and experimental animals. Statistically insignificant decrease was found in low dose (15mg/kgbw), intermediate dose (20mg/kgbw) and in high dose (25mg/kgbw) as compared to control. Contrary to our result Singh *et al*., (1991) has been reported significant decrease in hematocrit and hemoglobin content in Heteropneustes fossili when treated with sub-lethal concentration of propoxur.



CONCLUSION

This work proposed the pathophysiological consequences: hematotoxicity which may exert influence on disease manifestation. Results of this research revealed that carbaryl causes haematological changes in broiler chicks including anaemia Present research would provide baseline data for further studies.

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