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Physiological Studies on the Effect of Coffee - Caffeine on Some Blood Chemistry of Rabbits

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ABSTRACT

Objective: The current investigation was done to assess get information about the effect of different doses of Coffee-Caffeine on some blood chemistry: Total Cholesterols, Glucose and Triglycerides in rabbits. Methodology: The present study was carried out in the farm of poultry and laboratories belonging to the Department of Animal Production, Faculty of Agriculture and Veterinary Medicine –Ibb University. For a period of 14 days using 9 rabbits (weight about 1kg) were divided randomly into 3 groups each, and in each group, there were 3 animals .The group 1 served as control and received water instead of caffeine. The other 2 groups received different concentrations of caffeine 80, 160 mg /kg day, respectively to each rabbits via an oral gavages. **Results:** The treatment rabbits with caffeine (Dose 80mg/kg) showed significant decrease of triglycerides levels ($P<0.05$). Also, it was found that total cholesterol and glucose levels insignificantly decreased in treated rabbits with caffeine when compared with control group. The treatment rabbits with caffeine (Dose-160mg/kg) showed significant decrease of triglycerides level ($P<0.05$). Also, in case of glucose level, it was found insignificant decrease in treated rabbits with caffeine compared to non-treated one. However, total cholesterol level showed insignificant increase in treated rabbits by caffeine compared to non-treated group. **Conclusion:** This study concludes that clinical hematological and chemistry data can be useful aids for hematological constituents reflect the physiological responsiveness of the animals to its internal and external environment which include feed and feeding. Therefore it worth's to understanding how the intake of coffee caffeine change the blood and biochemical function of the bodies.

INTRODUCTION

Coffee is one of the most frequently consumed beverages in the world, and it is known to be a psychoactive beverage with stimulating effect on the central nervous system.

Caffeine, one of the main constituents of coffee, has been shown to have wide spectrum activities in several biological systems. In addition to caffeine, coffee contains chlorogenic acid which has antioxidant, anti-mutation, anti-carcinogenic, anti-biotic, anti-hypertensive and anti-inflammatory actions [1].

Caffeine has many significant effects on metabolism in humans [2]. Such as reduction of glucose and insulin levels in rats [3].

Caffeine is probably the most frequently ingested pharmacologically active substance in the world. It is found in common beverages (coffee, tea, soft drinks), in products containing cocoa or chocolate, and in medications. Because of its wide consumption at different levels by most segments of the population, the public and the scientific community have expressed interest in the potential for caffeine to produce adverse effects on human health [4].

For many years caffeine has been one of the most widely consumed drugs in the world [5]. In moderate doses (<300 mg) caffeine is well tolerated and few significant side effects have been reported [6].

The amount of triglycerides (or blood fats) in blood are one important barometer of metabolic health; high levels are associated with coronary heart disease, diabetes and fatty liver disease. Metabolism refers to the chemical process that converts the food we eat into the energy our cells need. Other measures of metabolic health that increase the risk of coronary heart disease includes too much low-density lipoprotein (LDL) cholesterol – the “bad” cholesterol and too little high-density lipoprotein (HDL) cholesterol – the “good” cholesterol. Other important risk factors include total and LDL cholesterol [7].

Coffee is one of the most frequently consumed beverages in the world hence, the current investigation was done to assess get information about the effect of different doses of Coffee-Caffeine on some blood chemistry: Total Cholesterols, Glucose and Triglycerides.

MATERIALS AND METHODS

Experimental Animals

The experiment was conducted on 9 rabbits (weight about 1kg). Kept for 1 week on a commercial diet in environmentally controlled conditions (25 ± 5^0C, 55 ± 5% humidity and 12h. light-dark cycle) with free access to diet and water *ad libitum*.

Experimental Design:

The nine rabbits were divided randomly into 3 groups each, and in each group, there were 3 animals. The first of rabbits was the control which kept on standard diet and drinking water instead of caffeine.

The second group of rabbits was given 80mg/Kg body weight/day caffeine by oral administration for 1 week.

The third group of rabbits was given 160mg/Kg body weight/day caffeine by oral administration for 1 week.

After one week of treatment, rabbits were fasted 12hr and then the blood was collecting from Marginal ear vein for measurement of total cholesterol, glucose and triglycerides ratio.

Blood Analysis:

The total cholesterol, glucose and triglycerides were determined by Roche diagnostic Kits (Germany) according to (Tietz, 1995) [8].

Statistical Analyses:

Statistical analysis of data obtained was carried out by applying the computer program **SAS, (1996). Duncan's test, (1955)** [9] was applied between means to test the significance between them. The following statistical model was used for analysis the data obtained for hematological parameters:

$$Xijk=\mu+\alpha i+Rj+(\alpha R)ij+eijk$$

Where:

Xijk = The observation of the i^{th} treatment and j^{th} replicate.

μ = The overall mean.

αi = The effect of i^{th} treatment.

Rj = The effect of j^{th} replicate.

αRij = The interaction between i^{th} treatment and j^{th} replicate.

eijk= Experimental error.

RESULTS AND DISCUSSION

Effect of Coffee-Caffeine on Some Blood Chemistry of Rabbits at Different Doses:-

Total Cholesterol (mg/dl):-

After seven days of treatment with caffeine, it was found insignificant decrease of total cholesterol level in dose (80mg /kg) group which was (19.33mg/dl) as compared with control group (22.67mg/dl). While it was found insignificant increase of total cholesterol level in dose (160mg/kg) group which was (27.67mg/dl) as compared with control group (22.67mg/dl) as presented in Fig. (1).

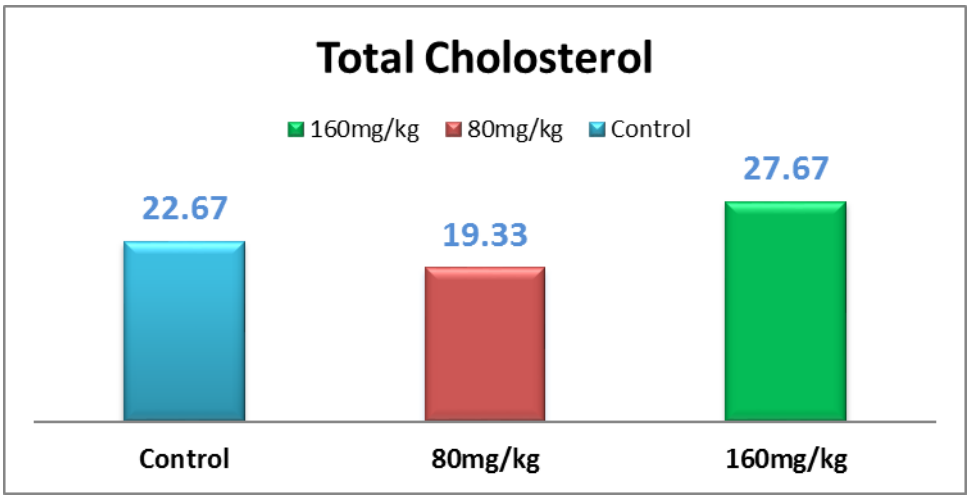

Figure No. (1): Means value of the effect of Coffee-Caffeine on total cholesterol in rabbits at different doses

Glucose: -

After seven days of treatment with caffeine, it was found non-significant decrease of glucose concentration in dose (80mg /kg and 160mg/kg) group which was (113.33mg/dl and 92.33mg/dl) respectively as compared with control group (169.00mg/dl) as presented in Fig. (2). This decreasing in our opinion due to chronic caffeine consumption reduced glucose level, this if not surprising in view of significant and tissue specific effects of adenosine on insulin sensitivity. Adenosine via activation of A1 receptor decrease the sensitivity to insulin in skeletal muscle, tissue that is considered the most important site for glucose disposed in response to insulin.

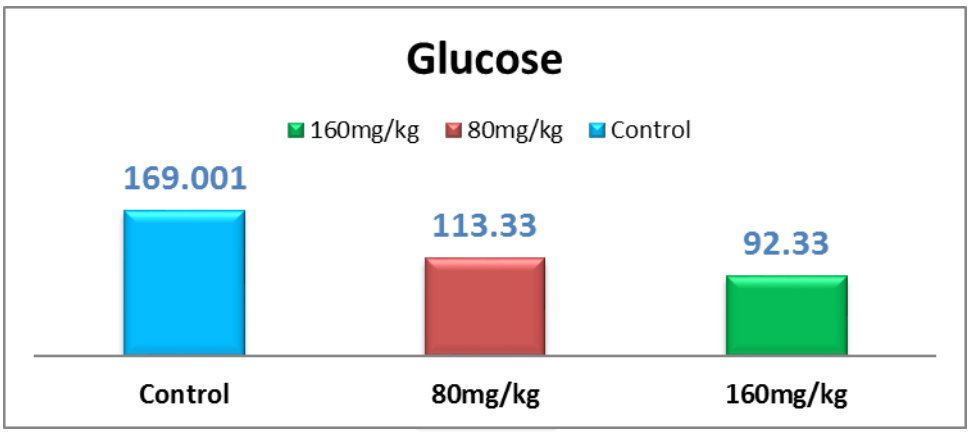

Figure No. (2): Means value of the effect of Coffee - Caffeine on glucose in rabbits at different doses

Triglycerides (mg/dl):-

After seven days of treatment with caffeine, it was found decreased significantly ($P<0.05$) of triglycerides in dose (80mg/kg and 160mg/kg) groups which were (67.00 mg/dl and 68.33mg/dl), respectively as compared with control group (128.00mg/dl) as presented in Fig. (3).

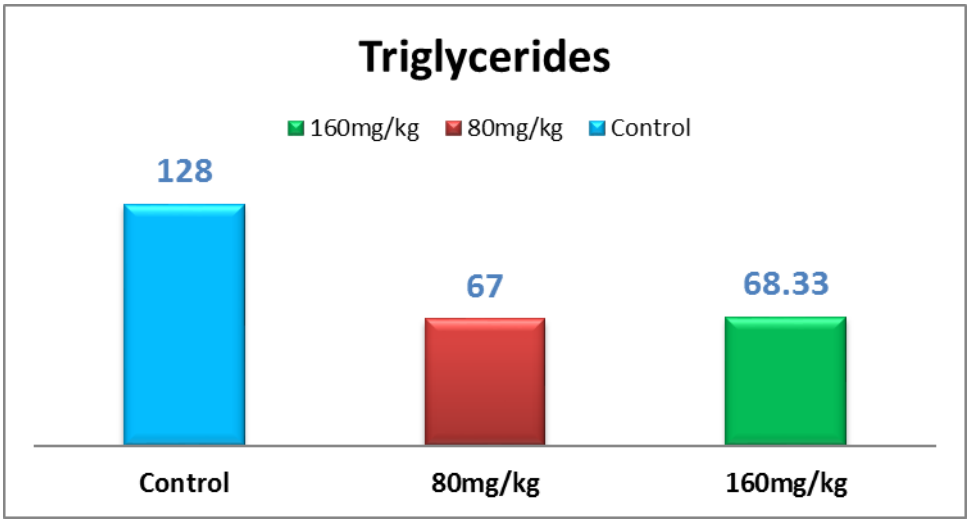

Figure No. (3): Means value of the effect of Coffee - Caffeine on triglycerides in rabbits at different doses

CONCLUSION

Caffeine is probably the most frequently ingested pharmacologically active substance in the world. It is found in common beverages (coffee, tea, soft drinks), in products containing cocoa or chocolate, and in medications. Because of its wide consumption at different levels by most segments of the population, the public and the scientific community have expressed interest in the potential for caffeine to produce adverse effects on human health [10].

It should be mentioned that clinical hematological and chemistry data can be useful aids for hematological constituents reflect the physiological responsiveness of the animals to its internal and external environment which include feed and feeding. Therefore it worth's to understanding how the intake of coffee caffeine change the blood and biochemical function of the bodies.

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