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Biochemical alteration with acute potassium sulfate toxicity in European rabbit, *Uryctolagus cuniculus* (Linn.)

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ABSTRACT

The aim of the study was to assess the influence of acute potassium sulfate toxicity on biochemical parameters of European rabbit. Rabbit treated with potassium sulfate showed reduction in protein and cholesterol while rise in creatinine and bilirubin. On concomitant to minimum and maximum percent alterations in protein [-5.5 to -20.0%], cholesterol [-6.7 to -13.3%], creatinine [8.3 to 16.6] and bilirubin [2.2 to 6.7%] were recorded on exposure period. The result suggests the modulation in blood serum biochemical on exposure on potassium sulfate. These parameters are valuable indicators of health and stresses in living organism.

Key words: Serum biochemical, alteration, potassium sulfate, rabbit.

INTRODUCTION

Both developed and developing countries that are progressing rapidly in the field of agriculture, biotechnology and industry introducing various kinds of harmful substances in to the environment and thereby facing a serious problem. In the agriculture industries artificial ripeners are used to ripener fruits and vegetables in the processes as transport, packaging, storage, pre- and post –harvest ripening, etc. Nowadays artificial ripeners such as calcium carbide, acetylene gas, carbon monoxide, potassium sulfate, zyme, ethephon, potassium dihydrogen arthoposphate, etc are used for fruit ripening. Which were used on fruits including apricots, mango, bananas, papayas, plums, cherry, pomegranate, Japanese fruits, etc. These artificial ripener known as silent killer because of their impact on memory loss, cerebral edema, colonic, prostates and lung cancer, quick-buck syndrome, DNA, RNA and hematological changes.

Potassium sulfate [K_2SO_4] is being used as pre-harvest ripener on mango, pineapple, coffee, tomato, cucumber, groundnut and rubber. It reported toxicity, flammability, destructive, self-reactive and incompatible with water oxidizing and other symptoms. Due to the adverse effect of this artificial ripener present study was assigned on European rabbit, *Uryctolagus cuniculus* (Linn.).

MATERIALS AND METHODS

Experimental animal: Normal adult healthy European rabbit, *U. cuniculus* weighting from 2.25±0.12kg was used in the experiment. They perched from Reena Rabbitory, Rahata and acclimatized at room temperature (26±2^{0}C). Experimental protocol was approved by the Institutional Animal Ethics Committee [IAEC]. They were maintained (55 cm L x 45 cm W x 30 cm H) in cage with a constant 12 hours light and dark rhythms. The control group provided water and food while treatment rabbit provided a food with acute dose at 5 mg/kg body weight [1]. The post treatment followed up to 28 day.

Experimental treatment: Potassium sulfate was dissolved in 2 ml distilled water. An acute oral dose was performed according to the Office of Prevention, Pesticide and Toxic Substances (OPPTS) guidelines following the limit test procedure. Animals were fasted over night prior to working.

Biochemical analysis: Blood sample was collected from ear artery using heparinzed syringes (5.000 UI) in sterilized vial on control 7, 14, 21 and 28 days. The following biochemical parameters were estimated according to standard method as: protein [2], cholesterol [3], bilirubin [4] and creatinine [5]. Observed data are presented in table 1.

RESULTS AND DISCUSSION

An observation made on blood serum biochemical contents indicates that the protein and cholesterol get decline while creatinine and bilirubin incline after the intoxication with potassium sulfate [table 1 and graph 1- 4].

Protein: Liver is responsible for the synthesis of plasma protein. After treated it showed minimum (-5.5%) and maximum (-20.0%) decline after intoxication on 28 and 7 days. The general trend of decline was 7th toward 28th days. Reduction in serum total protein in the present study may ascribe to lesser food intake, poor nutrition and liver malfunction of treated animal. Similar decline in total protein have been reported [6,7] after administration of textile dye waste water to rates. Several opinions have been put forward to explain it as decline in protein level showed the tress condition of the animal [8]. The depletion in protein may be due to proteolytic [9]. Toxicant influences the change in tissue protein into soluble functions lead to blood for use [10]. The reduction in protein are further comparable, increased proteolysis, shifting in nitrogen metabolism [11]. Inhibition of ribosomal activity resulted in protein degradation [12] are also being the possible reasons for depletion. Reduction in protein might be due to the metabolic stress caused by toxicant leads to depletion in of protein synthesis [13]. Under stress condition it supplied energy to metabolic pathway and biochemical reactions [14]. Another reason for depletion might be due to the low availability of amino acids, which would be used for fatty acid and cholesterol synthesis [15].

Creatinine: In the present study the level of creatinine increased significantly. The level of creatinine after two-week exposure showed incline up to 16.6% on 28 day. Similar type of incline trends was observed in the HDL, LDL and VLDL cholesterol. We know that the parameter is determined to assess the potential effects of chemical on glomerulus filtration rate [GFR]. As a substance is normally faltered by the glomerulus, an increase in serum concentration thus suggests a decrease in GFR [16, 17]. Sharma [18] reported that glomurule nepherosis and degradation of tubular epithelium in kidney of rat exposed to textile dye, along with alteration in serum biochemical parameters viz. creatinine, protein, cholesterol. Thus in the present investigation the renal toxicity might have increased the serum creatinine level. Creatinine is a spontaneously formed cyclic derivative of creatinine and closely filtered out by the kidney and no reabsoption. If the filtration of the kidney is deficient, creatinine blood levels rise up. Higher levels of creatinine indicate a falling glomeruluar filtration rate and as a result a decreased capability of the kidneys to excrete waste products.

Cholesterol: It has been observed that intoxication lead to reduction in cholesterol content. The depletion in cholesterol was maximum (-13.3%) and minimum in (-6.7%) at 7th and 28th day exposure to potassium sulfate respectively. A significant reduction in serum cholesterol, HDL, LDL, VLDL level was found in the present study may be due to reduction in food intake and malnutrition and stress condition caused by potassium sulfate. Sharma [6,18] found similar result in the rat after treating with textile dye. Post treated rat did not show any recovery in serum biochemicals. Similarly [19,20] reported a marked reduction in cholesterol level of Japanese quails and boiler chicken consequent to dietary aflatoxin. The decrease in serum cholesterol indicated degenerative changes and hypofunction of liver. The effect of intoxication to prolong the dose was found close dependent [19].

Bilirubin: Overall an incline was noticed in bilirubin, directly and indirectly after exposure to potassium sulfate. The level of bilirubin after two-week exposure showed rose up to maximum 6.7%,12% and 10% in total, direct and indirect bilirubin content on 28th day respectively. Similar trend was also noticed in direct and indirect bilirubin contents. It is a bile pigment formed from the breakdown of heam in RBC. Bilirubin elevated level may create disease. Gilbert's syndrome and Crigler-Najjar syndrome are characterized by increased bilirubin in the serum.

Hyperbilirubinema may lead to accumulation of bilirubin in brain region leads to neurological deficits, jaundice in neonatal [21], kernicterus cancer [22].

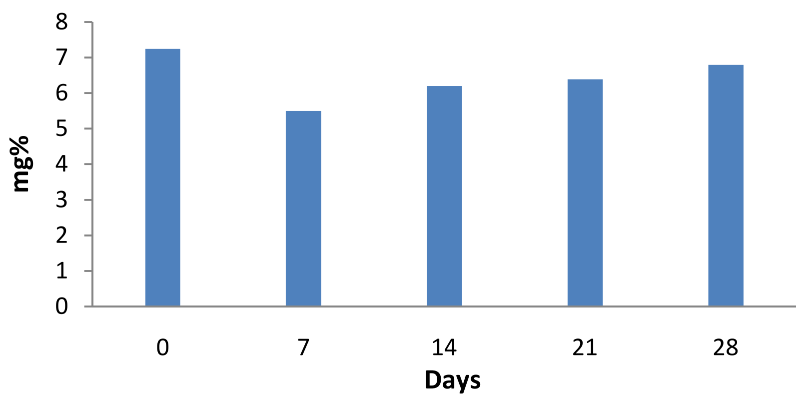
Present study indicates that rabbit are susceptible to potassium sulfate which produced serum biochemical alteration in blood. The blood biochemical parameters tests have been an important diagnostic tool in medical scie4nce. These parameters are valuable indicators of health and stresses in living organisms. The present work use to establish the extent of toxicity of potassium sulfate.

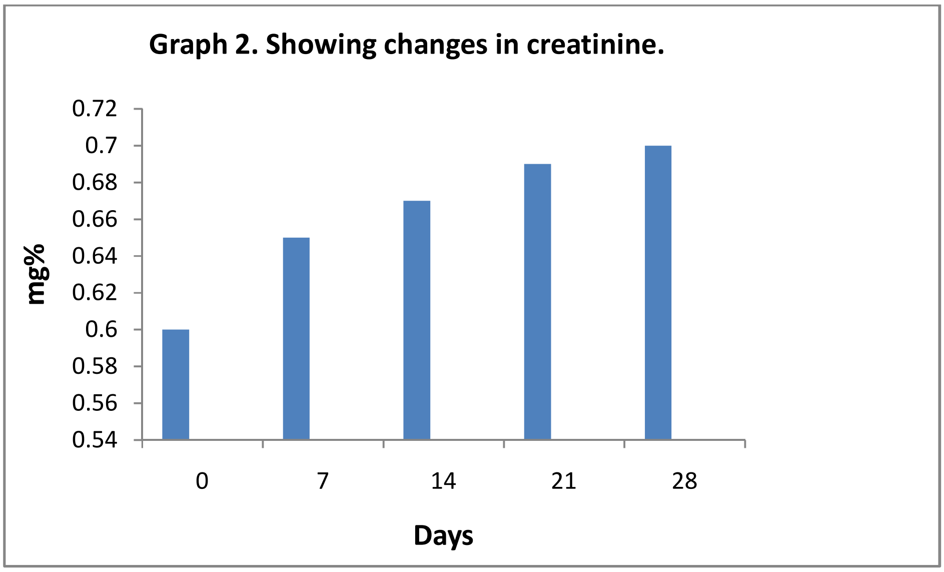
Table 1. Showing biochemical changes in blood serum

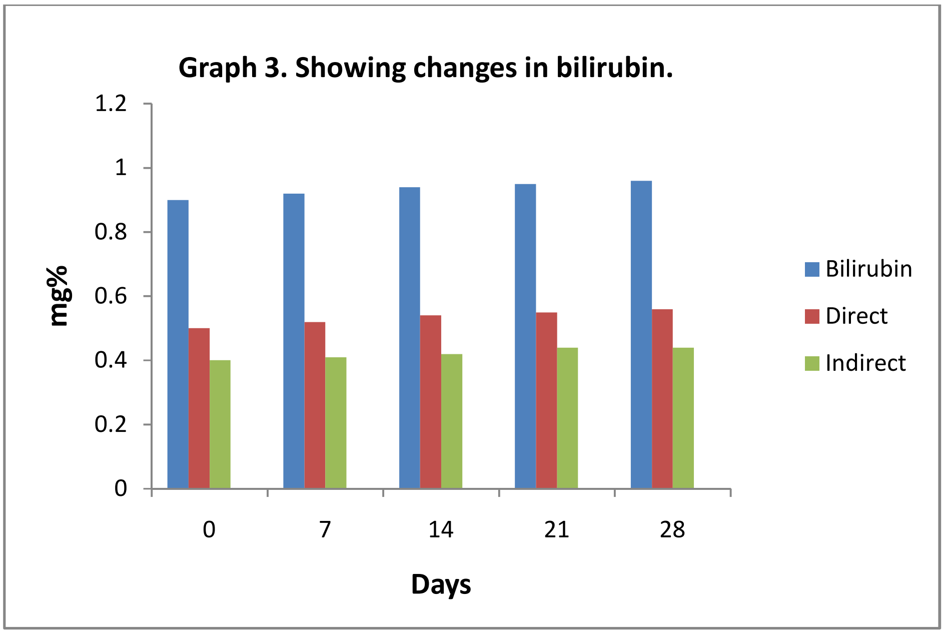
No.	Parameters (mg %)	Exposure days				
		Control	7	14	21	28
1	Protein	7.25±0.5 [100]	5.5±0.3 [-20.0]	6.2±0.4 [-17.3]	6.40±0.4 [-11.7]	6.8±0.2 [-5.5]
2	Creatinine	0.6±0.1 [100]	0.65±0.1 [8.3]	0.67±0.1 [11.7]	0.69±0.3 [15.0]	0.70±0.1 [16.6]
3	Cholesterol	151.2±0.2 [100]	131.2±0.3 [-13.3]	135.2±0.4 [-10.2]	140.3±0.3 [-7.4]	141.2±0.4 [-6.7]
	a. HDL cholesterol	41.2±0.2 [100]	37.8±0.3 [-8.3]	37.0±0.5 [-10.2]	35.5±0.6 [-13.8]	35.0±0.3 [-15.0]
	b. LDL cholesterol	98.6±0.3 [100]	83.0±0.2 [-15.8]	89.2±0.5 [-9.5]	92.0±0.4 [-6.7]	95.2±0.6 [-3.4]
	c. VLDL	11.3±0.5 [100]	10.0±0.3 [-11.5]	8.8±0.2 [-22.1]	10.8±0.5 [-4.4]	11.0±0.3 [-2.7]
4	Bilirubin	0.90±0.3 [100]	0.92±0.5 [2.2]	0.94±0.4 [4.4]	0.95±0.5 [5.6]	0.96±0.6 [6.7]
	a. Direct	0.50±0.1 [100]	0.52±0.1 [4.0]	0.54±0.1 [8.0]	0.55±0.1 [10.0]	0.56±0.1 [12.0]
	b. Indirect	0.40±0.1 [100]	0.41±0.1 [2.5]	0.42±0.1 [5.0]	0.44±0.1 [10.0]	0.44±0.1 [10.0]

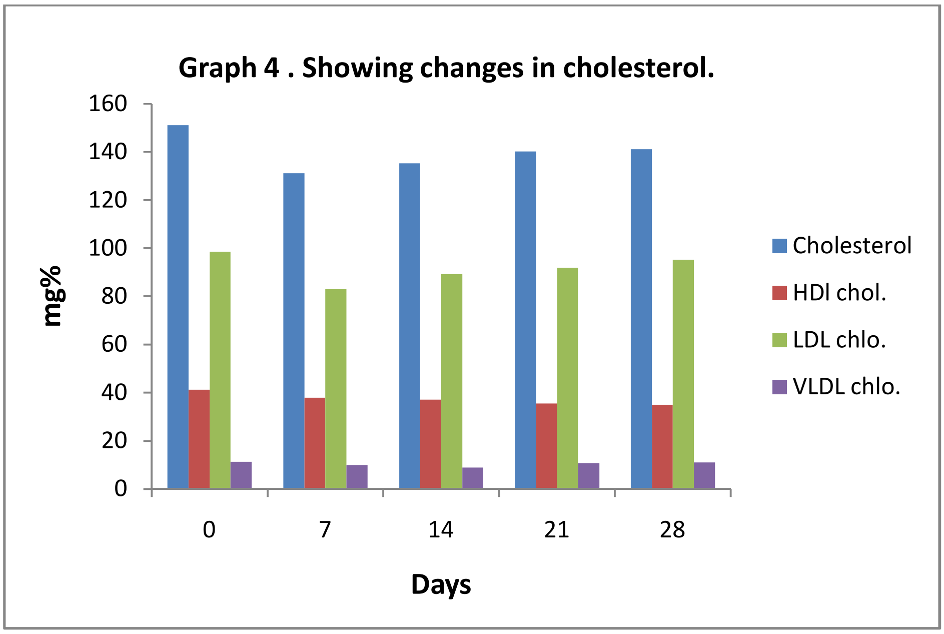
Figures in parenthesis are percent variation over control.

Graph 1. Showing changes in protein.




Graph 2. Showing changes in creatinine.
mg%
0.72
0.7
0.68
0.66
0.64
0.62
0.6
0.58
0.56
0.54
0
7
14
21
28
Days


Graph 3. Showing changes in bilirubin.
mg%
1.2
1
0.8
0.6
0.4
0.2
0
0
7
14
21
28
Days
Bilirubin
Direct
Indirect



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