

Full length Research paper

Effect of chronic administration of *Aloe vera* extract on plasma biochemistry in rabbits

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Due to excessive use, synthetic medicines are going to be expensive and resistant, their residues accumulate in blood, that is why slowly and gradually they become resistant. Alternatives to synthetic medicines are herbal medicines that are cheap, with minimum or no side effect. Previous studies found that liquid extract of *Aloe vera* plant proved beneficial for animal's health as it has immune-modulating, hypolipidemic, hypoglycemic and haematinic effects. The aim of this study was to investigate the effect of *A. vera* extract on plasma biochemistry. A total of twenty (n = 20) male rabbits were selected and divided into 4 groups; P, Q, R and S with five (n = 5) in each group. The group P was kept as control while group Q, R and S were given oral *A. vera* extract at the dose of 200, 300 and 400 mg/kg body weight, respectively daily for 21 days. Blood samples were taken on various days; 0, 7, 14 and 21 of treatment. Research has found that *A. vera* significantly (p < 0.05) decrease cholesterol level, that is indication that *A. vera* has influence on adipose tissues.

Key words: *Aloe vera*, haematology, plasma biochemistry.

INTRODUCTION

Herbal treatment has been used from ancient times for the remedies of many pathological lesions and pathologies. There are many plants with medicinal characteristics;

Trigonella foenum graecum, *Allium sativum*, *Gymneema slyvestre*, *Syzigium cumini* and *Aloe vera* (Saif-ur-rehman et al., 2011). *A. vera* is a well know plant that has been

grown in houses as first aid in many countries. It has been reported that there are 275 species of *A. vera*, out of that, 100 occur in South Africa (Maphosa and Masika, 2010), 4 occur in India that are *Aloe ferox*, *Aloe inermis*, *Aloe forbesii* and *Aloe barbadensis* and 12 to 15 occur in Arabian Peninsula (Urvashi and Raju, 2012). *A. vera* is a succulent plant that is mainly composed of inner liquid portion and outer greenish covering that has small spines. The former is about 99.5% and the latter is about 0.5% that constitutes the whole solid portion (Hamman, 2008).

Research has investigated that there are about 200 compounds in *A. vera* out of them, 75 are well known for their biological active ingredients. These active ingredients are aloe polysaccharides (Jun et al., 2005), cholesterol reducing ingredients (anthraquinones, isoAloeresin-D, iso-rabaichromone, neoAloesin-A) (Ni and Tizard, 2004) tannins, sterols (lupeol, Aloetic acid, choline and choline salicylate, complex mucopolysaccharides similar to hyaluronic acid, sapogenins), enzymes such as catalase, alliinase, amylase and cellulose. *A. vera* gel contains anthrones and anthraquinones acetylated mannans, anthraquinone C-glycosides, polymannans and lectins (Boudreau and Beland, 2006).

It has been reported that *A. vera* has been used for remedies of many non infectious infestations such as enhance wound healing by proliferation of epithelial and fibrous tissue (Reddy et al., 2011). It has been used to prevent and treat various lesions of gastro intestinal parasites mainly helminths (Maphosa and Masika, 2010). Research has investigated that *A. vera* has influence on central nervous system and enhancing ependymal cells of brain that are source of cerebro spinal fluid in cavities called ventricles (Kosif et al., 2008). *A. vera* promote the function of liver and pancreas by enhancing aspartate amino transferase (AST) and alanine transferase (ALT) that have been investigated as hepato-specific enzymes and cause major damage to hepatocytes (Iji et al., 2010).

It has been investigated that *A. vera* has antifungal properties and used to prevent many fungal infestations and fungal diseases. Instead of this, *A. vera* has been used as preventive measure as well as to treat variety of infectious disease. It has been used as an active antibacterial agent against bacteria such as *Klebsella*, *Pseudomonas*, *Streptococcus*, *Staphylococcus*, *Escherichia coli*, *Salmonilla* etc (Hamman, 2008). Research has investigated that the vital medicinal *A. vera* plant has been used for remedies of various viral diseases. It has been used to prevent animal and humans from hepatitis by enhancing function of liver and inhabiting hepatitis virus (Rabe et al., 2005). It has also been used to enhance immune system; mannose polymers

are special polysaccharides derived from *A. vera* with immune modulating properties (leung et al., 2004). It has also been investigated that aloe polysaccharides are used to stimulate hematopoietic stem cell, myeloid and erythroid colony forming cell and macrophage colony forming cell (Im et al., 2005). Considering its hypoglycaemic effect, *A. vera* has been used to cure diabetic as well as normal rats (Saif-ur-Rehman et al., 2011). By considering clinical and therapeutic importance of *A. vera*, the present study is proposed to know safe and effective dose of *A. vera* extract; and also to know its biochemical and haematological properties.

MATERIALS AND METHODS

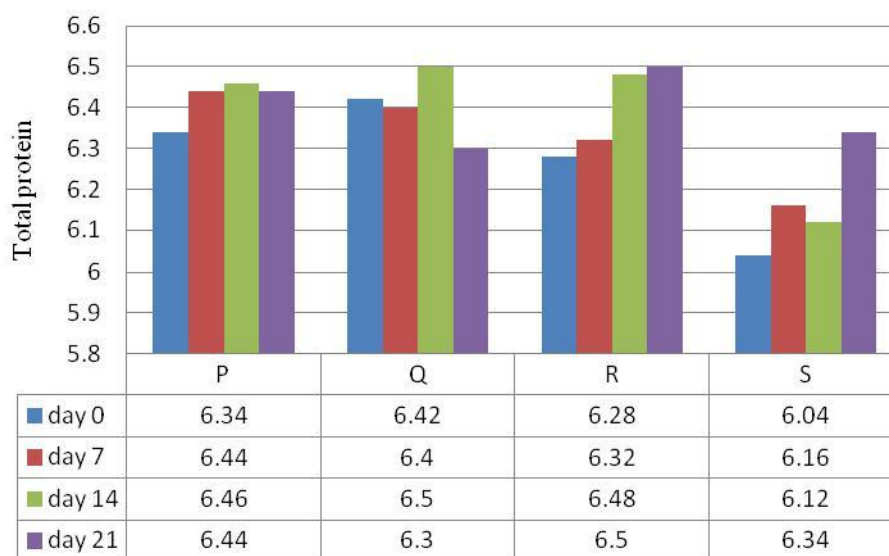
A. vera plant was brought from Hyderabad district of Sindh province, fresh leaves of *A. vera* was separated and washed. A leaf was splitted in two parts by removing spiny margins, white transparent inner gel of *A. vera* was obtained, blended and weighed. Two hundred grams (200 g) of blended *A. vera* liquid was boiled with 400 ml of distilled water for 20 min. After boiling, the extract was cooled, filtered and stored in a refrigerator (4°C) until further use. A total of 20 male rabbits (average body weight: 1.5 kg) were selected and divided into four groups; P, Q, R and S (with 5 rabbits in each group). Feed (rice and green grass) and water was given to them according to free choice of feeding. Group P was kept as control while group Q, R and S were given oral *A. vera* extract at the dose of 200, 300 and 400 mg/kg body weight, respectively daily for 21 days. Blood was collected (on 0, 7, 14, and 21st day) of treatment from central ear vein and cephalic vein, and transferred to test tubes containing anticoagulant (EDTA: Ethylene diamine tetra acetate). The blood samples were brought to Post Graduate Laboratory of Veterinary Physiology, Sindh Agriculture University, Tandojam for analysis and further investigations. Serum protein, globulin, albumin, urea and creatinine were investigated according to Ogunsanmi et al. (1994). The plasma triglyceride and cholesterol were determined according to Toro and Ackermann (1975).

RESULT

Total protein, albumin and globulin in various groups; P, Q, R and S on various days (1, 7, 14 and 21) of treatment are significantly different (Table 1 and Figures 1 to 3). It has also been investigated that *A. vera* extract have significant influence ($p < 0.05$) on urea and creatinine, in various groups (Q, R and S), on various days of treatment, by various doses of 200, 300 and 400 mg/kg (Table 2 and Figures 4 and 6). Furthermore it has been found that *A. vera* extract significantly ($p < 0.05$) lowers cholesterol level in all groups (Q, R and S) on various days of treatment, respectively (Table 2 and Figure 5). It is found that the dose of 300 mg/kg and the dose of 400 mg/kg brought equal decrease in cholesterol level on 7th day, while on 14th day there was gradual decrease caused

Table 1. Plasma biochemistry of rabbits given oral administration of *A. vera* extract (Mean \pm SD).

Day	Rabbit group	Total protein	Albumin	Globulin
0	1	6.34 \pm 0.32 ^a	3.62 \pm 0.04 ^a	3.38 \pm 0.08 ^a
	2	6.42 \pm 0.16 ^a	2.94 \pm 0.34 ^b	3.40 \pm 0.15 ^a
	3	6.28 \pm 0.19 ^a	3.84 \pm 0.33 ^b	3.30 \pm 0.10 ^a
	4	6.04 \pm 0.32 ^a	2.96 \pm 0.27 ^b	3.36 \pm 0.08 ^a
7	1	6.44 \pm 0.05 ^a	3.58 \pm 0.04 ^a	3.40 \pm 0.10 ^a
	2	6.40 \pm 0.10 ^a	2.94 \pm 0.32 ^b	3.36 \pm 0.11 ^a
	3	6.32 \pm 0.13 ^a	2.88 \pm 0.27 ^b	3.30 \pm 0.10 ^a
	4	6.16 \pm 0.41 ^a	2.96 \pm 0.33 ^b	3.34 \pm 0.08 ^a
14	1	6.46 \pm 0.16 ^a	3.44 \pm 0.15 ^a	3.34 \pm 0.08 ^a
	2	6.50 \pm 0.07 ^a	2.94 \pm 0.36 ^b	3.28 \pm 0.08 ^a
	3	6.48 \pm 0.08 ^a	2.94 \pm 0.31 ^b	3.28 \pm 0.13 ^a
	4	6.12 \pm 0.50 ^a	2.86 \pm 0.30 ^b	3.30 \pm 0.12 ^a
21	1	6.44 \pm 0.13 ^a	3.44 \pm 0.19 ^a	3.34 \pm 0.11 ^a
	2	6.30 \pm 0.51 ^a	2.92 \pm 0.36 ^b	3.38 \pm 0.13 ^a
	3	6.50 \pm 0.18 ^a	2.96 \pm 0.27 ^b	3.36 \pm 0.13 ^a
	4	6.34 \pm 0.24 ^a	2.94 \pm 0.36 ^b	3.32 \pm 0.10 ^a

**Figure 1.** Total protein of various groups on various days.

by the dose of 300 and 400 mg/kg and highest decrease caused by 200 mg/kg. Finally, on 21st day the dose of 300 and 400 mg/kg brought equal changes in cholesterol level (Table 2 and Figure 5).

DISCUSSION

Haematology and plasma biochemistry are basic indicators and fundamental markers of various pathologies

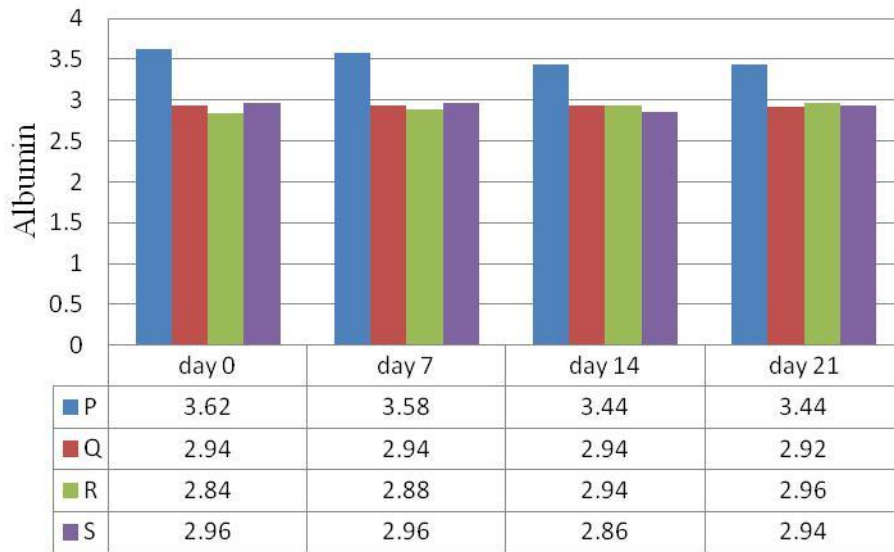


Figure 2. Albumen of various groups on various days.

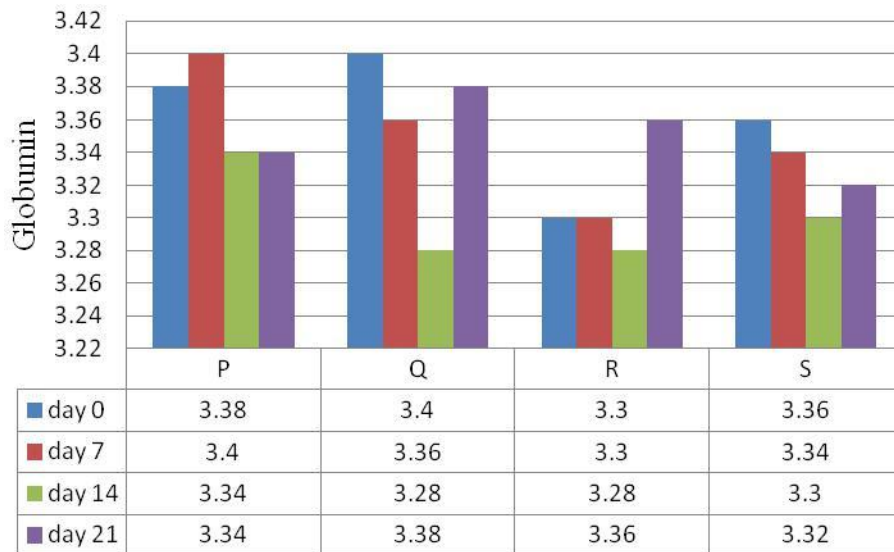


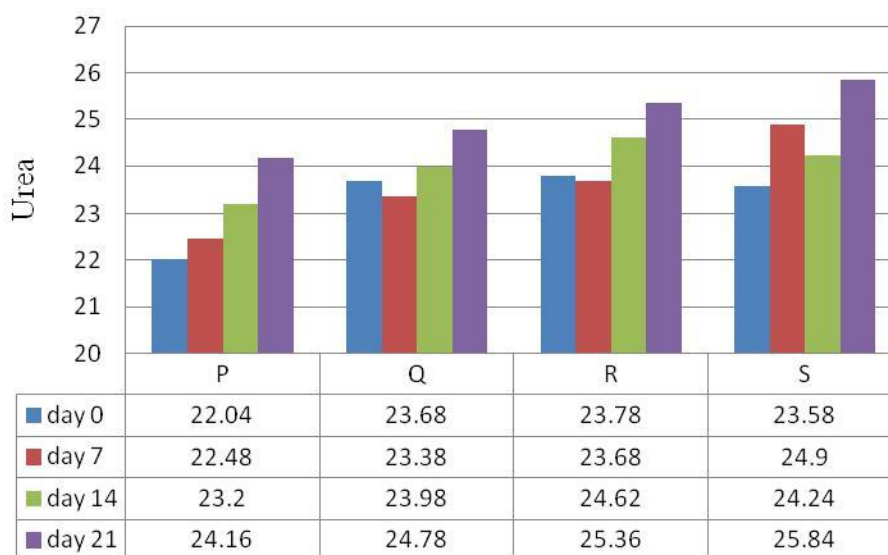
Figure 3. Globulin of various groups on various days.

and pathogenic agents. Therefore investigators choose haematology and plasma biochemistry to diagnose disease within short period of time. Previous investigations found that *A. vera* extract improved immune cells and complement system (Amjad et al., 2014; Ghasem et al., 2011; leung et al., 2004; Im et al., 2005), active anti-bacterial agent (Hamman., 2008) improves ventricles key component of producing cerebrospinal fluid (Kosif et

al., 2008). It is hypothesised that *A. vera* improves plasma proteins for that reason, plasma contents are assessed and it was found that it causes gradual changes in the means of total protein, albumin, globulin, urea, and creatinine in different groups were not significantly different ($p < 0.05$) but it shows regular variations, gradual increase or decrease in all the three doses on 200, 300 and 400 mg/kg on different days of treatment, respectively. Besides

Table 2. Plasma lipid and metabolites (mg/dl) of rabbits given oral administration of *Aloe vera* extract (Mean \pm SD).

Day	Rabbit group	Cholesterol	Urea	Creatinine
0	1	44.96 \pm 0.18 ^a	22.04 \pm 0.72 ^b	1.02 \pm 0.10 ^{ab}
	2	43.06 \pm 2.88 ^{abc}	23.68 \pm 1.94 ^{ab}	1.14 \pm 0.23 ^{ab}
	3	41.68 \pm 3.19 ^{abc}	23.78 \pm 2.20 ^{ab}	1.22 \pm 0.19 ^{ab}
	4	39.58 \pm 4.51 ^{abc}	23.58 \pm 1.78 ^{ab}	1.24 \pm 0.11 ^a
7	1	44.42 \pm 0.40 ^{ab}	22.48 \pm 0.77 ^{ab}	1.00 \pm 0.07 ^{ab}
	2	42.58 \pm 2.34 ^{abc}	23.38 \pm 1.12 ^{ab}	1.10 \pm 0.15 ^{ab}
	3	38.34 \pm 8.43 ^{bc}	23.68 \pm 1.94 ^{ab}	1.22 \pm 0.14 ^{ab}
	4	38.40 \pm 3.91 ^{bc}	24.90 \pm 2.16 ^{ab}	1.16 \pm 0.08 ^{ab}
14	1	44.86 \pm 0.20 ^a	23.2 \pm 1.30 ^{ab}	0.96 \pm 0.05 ^b
	2	41.44 \pm 2.66 ^{abc}	23.98 \pm 1.34 ^{ab}	1.06 \pm 0.18 ^{ab}
	3	39.30 \pm 3.28 ^{abc}	24.62 \pm 1.78 ^{ab}	1.20 \pm 0.21 ^{ab}
	4	38.44 \pm 4.38 ^{bc}	24.24 \pm 1.32 ^{ab}	0.98 \pm 0.13 ^{ab}
21	1	44.26 \pm 0.73 ^{ab}	24.16 \pm 1.09 ^{ab}	1.00 \pm 0.12 ^{ab}
	2	41.54 \pm 2.41 ^{abc}	24.78 \pm 1.44 ^{ab}	1.12 \pm 0.13 ^{ab}
	3	37.96 \pm 2.98 ^c	25.36 \pm 3.21 ^{ab}	1.12 \pm 0.17 ^{ab}
	4	38.58 \pm 4.06 ^{bc}	25.84 \pm 1.77 ^a	1.10 \pm 0.07 ^{ab}

**Figure 4.** Urea of various groups on various days.

Besides this, it was found that urea is increased in all three doses on all three treated groups and highest increase was noted in group S that was given 400 mg/kg of *A. vera* extract (Tables 1 and 2 and Figures 1, 2, 3, 4 and 6), these investigation are contrary to Iji et al. (2010). Regular administration of *A. vera* extract significantly decreased ($p < 0.05$) cholesterol level in various groups

(P, Q, R and S), respectively. Highly significant decrease occur in groups R and S on day 7, 14 and 21 that was 38.40 ± 3.91 , 39.30 ± 3.28 , 37.96 ± 2.98 and 38.40 ± 3.91 , 38.44 ± 4.38 and 38.58 ± 4.03 , respectively (Table 2 and Figure 5). Research has proved that decrease in cholesterol is due to lower production of endogenous cholesterol transporter. It may be due to mannans that

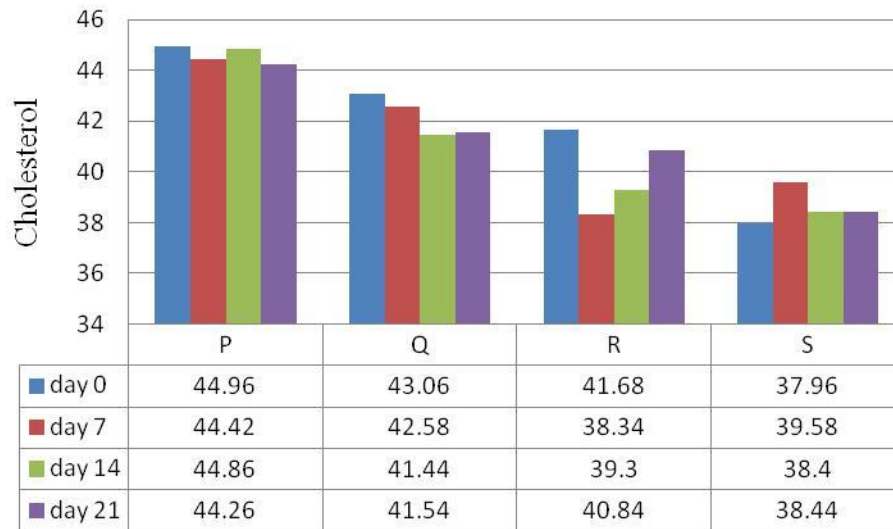


Figure 5. Cholesterol of various groups on various days.

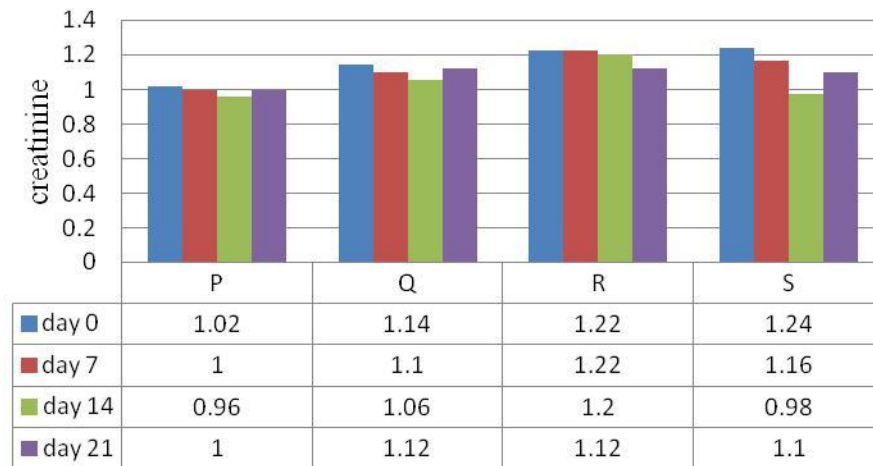


Figure 6. Creatinine of various groups on various days.

inhibit cholesterol absorption (Sikarwar et al., 2010) or active involvement of liver tissues in fatty acid oxidation and formation of lipoproteins (Rajasekaran et al., 2006).

Conclusion

The study therefore concluded that chronic oral administration of *A. vera* extract has decreasing effects on cholesterol level and improves haematology. We believe further investigations with similar results will be

helpful to know the mechanism of these modifications in the level of cholesterol and haematological parameters.

Conflict of Interests

The author(s) have not declared any conflict of interests.

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