Original Research Article

Effects of *Aloe vera* gel on the homeopoietic, biochemical and histological parameters and Bone marrow of Wistar rats.

Abstract

Aloe vera is well known for its medicinal properties. This plant is one of the richest natural sources of health for human beings. The chemistry of the plant has revealed the presence of more than 200 different biologically active substances. The aloe plant is said to have effect on so many organs including the homeopoietic tissue and organs. This study was conducted to confirm this assertion.

A total of 16 male albino rats weighing between 120-150g were grouped into four (4) with 5 rats each (A, B, C & D). Group A to C served as the experimental groups while group D served as the control group, which received food and water only. Group A, B and C received 250mg/kg, 500mg/kg, and 750mg/kg of the extract, respectively for 14 days. Group D served as the control was given clean water and normal feed. The rats were then sacrificed under anesthesia and the blood obtained was subjected to the biochemical investigation. The bone marrow through the bone was obtained and preserved in formalin for subsequent histopathological processing examination. Our results show that *Aloe vera* has positive effect (by increasing the count) on the white blood cells, but decreases the Red blood cells count, packed cell volume counts, which may lead to anaemia in prolonged ingestion. *Aloe Vera* decrease red blood cells production, but enhance platelet production, also encourage presence of mild fatty tissues in the bone marrow.

Keywords: Aloe vera, red blood cells, white blood cells, platelets

Introduction

Aloe vera also called aloe a perennial plant which is native to Africa and common in Madagascar, the Arabian Peninsula, and the islands of Africa (Springboard, 2004)**.** The plant can be separated into two basic product gel and latex. *Aloe Vera* gel is the leaf pulp or mucilage, a thin clear Jelly-like substance obtained from the parenchymal tissue that makes up the inner portion of the leaves (Tyler, 1993). The leaves are thorn-edged, one to two feet long and two to three feet wide with gradually tapering tip point. The leaves are the medicinal part of the plant (Springboard, 2004). The aloe plant is said to have effect on so many organs including the homeopoietic tissue and organs. This study was conducted to confirm this assertion.

Several variations exist of the Aloe plant, but only one variety has a legendry medicinal reputation dating back thousands of years (Tyler, 1993). Pharmaceutically, it is used as a laxative; the juice is often dried to produce the aloe granules that are brown from exposure to air. The plant or its product is a natural cleaner, powerful in penetrating tissues; relieving pain associated with joints and muscles; bactericidal; virucidal; fungicidal; anti-inflammatory etc. It breaks down and digests dead tissues, and moisturizes tissues (Natures choice, 1998). The plant has been traditionally used through the centuries for both internal ingestion as well as for topical purposes. The aloe plant has enjoyed wide use for its enhancement of normal gastro-intestinal functioning. It has been used by many for constipation, inflammatory conditions of the small and large intestines. The plant is also used in the treatment of haemorrhoids, irritable bowel syndrome, arthritis, and colitis. It slows the development of liver cancer; reduce the incidence of tumour and causes tumour regression in induced cancer in mice (Chitrap et al, 1998).

Topically, aloe has demonstrated benefits in the healing of minor cuts, wounds and burns (Visuthikosol et al, 1995). It is further used in the cosmetic industries as hydrating agents in lipids, cream, sun lotion, shaving cream, lip balms, healing ointments, soap and face peak. The gel is a mild anesthetic, relieving itching, swelling and pains (Danhol, 1980). Research since the 1930s have shown that the clear gel has a dramatic ability to heal wounds, ulcers and burns by putting a protective coating on the affected areas and speeding up the healing rate. When the leaf is broken, its gel is placed on burns to relieve pain and vent blisters. The action of *Aloe vera* on surfaces and membranes, rather than solid organs, may account for some of the healing properties of Aloe vera (Davis et al, 1989; Fulton, 1990; and Heggers, 1996). Aloe may reduce inflammation, decrease swelling and reduces, and accelerate wound healing (Davis, 1989). Aloe has shown biologic anti-inflammatory properties over a wide range of animal experiments. The sterols in aloe have strong activities to inhibit acute inflammation, similar to cortisone but without any side effect. Winter (1993) reported that *aloe vera* exerts an effect on the cytokine system resulting in immunomodulation. Patchen et al (1984) has indicated that Aloes has the ability to stimulate macrophages which help to get the immune system sensitive to dangerous microorganisms and tumour cells and assist in their destruction.

It has been documented that taking *Aloe vera* orally helps mend tissue damaged by cobalt radiation, a

typical result of radiation cancer treatments provided by nuclear medicine (Richardson et al, 2005). Some studies indicate that aloes should not be used during pregnancy. Aloes may have purgative effects. It is a common, but unsubstantiated belief that overdoses of strong purgatives will cause abortions as they tend to cause everything in the body to be expelled. It is also believed to contribute to abnormalities of the fetus if taken orally during the first days of pregnancy. The aim of the study is to experimentally access the effect of *aloe vera* on the homeopoietic tissue and bone marrow, specifically on the blood cells (Red blood cells, white blood cells, platelets, differential count) and on haemoglobin concentration and packed cell volume.

The plant is a rich source of many natural health-promoting substances which are divided into vitamins, minerals, enzymes, sugars, anthroquinones, lignins, saponins and fatty acids. It is rich in all vitamins (vitamin C, vitamin A, vitamin E and the B-vitamins with the exception of vitamin D). Also beta carotene, folic acid and choline are present (David and Rober, 1997). Phosphorus, potassium, zinc, manganese, chromium, chloride, copper, iron, calcium, sodium and magnesium are some of the minerals found in *Aloe vera*. These mineral are essential for the proper functioning of various enzyme system in different metabolic pathways. *Aloe vera* contains 12 phenolic compounds known as anthraquinones, which are found particularly in the sap.

Blood a connective tissue in fluid form or as a modified connective tissue (Singh, 2002). The whole blood is slightly heavier and three to four times more viscous than water. The average sized adult has about five litres of blood which constitute about seven percent of the total body weight (Guyton and Hall, 2000). Blood is a mixture of cells and the fluid component called plasma in which the cells float in. It also contains other substances like nutrients such as sugar, hormones, clotting agents, and waste products to be flushed out of the body. The formed elements constitute approximately 45% of the total blood volume (the hematocrit) and the plasma accounts for the remaining 55% (Guyton and Hall, 2000). The Red blood cells make up 40-45 percent of blood volume. And they give blood its characteristic colour. They are flattened, biconcave disc, about 7micrometre in diameter and 2.2micrometre thick. Their unique shape relates to their function of transporting oxygen and providing an increased surface area through which gas can diffuse. Also, they can change remarkably as the cells squeeze through the capillaries (Guyton and Hall, 2000). The erythrocytes lack nucleus and mitochondria (they get energy from anerobic respiration).

Leukocytes differ from the erythrocytes in several ways. Leukocytes have nuclei and mitochondria and can move in an amoeboid fashion (diapedesis). Because of amoeboid ability, leukocytes can squeeze through pores in capillary walls and get to a site of infection, whereas erythrocytes usually remain confined within blood vessels. The movement of leukocytes through capillary walls is called diapedesis. Leukocytes, which are almost invisible under the microscope unless they are stained, are classified according to their stained appearance (Singh, 2002). Platelets or thrombocytes are the smallest of the formed elements and are actually fragments of large cells called megakaryocytes, which are found in the bone marrow. Platelets are round, oval, or irregular disc about 3μm in diameter. It is anucleated, like leukocytes, are capable of amoeboid movement. The number of platelet in each microliter of blood is normally about 250000 to 500000. The life span of platelets is about 10 days (Guyton and Hall, 2000; Singh, 2002). The platelets help blood clot.

Blood cells are constantly formed through a process called haematopoiesis. In embryonic life, blood cells are first formed in relation to mesenchymal cells surrounding the yolk sac. After the second month of intrauterine life blood formation starts in the liver; later in the spleen, and later in the bone marrow. In postnatal life, blood formation is confined to bone marrow and lymphoid tissues. However, under conditions in which the bone marrow is unable to meet normal requirements, blood cell formation may start in the liver and spleen; this is referred to as extra-medulary haemopoiesis. The haemopoietic stem cells that are present only in the bone marrow give rise to all blood cells other than lymphocytes. The lymphopoietic stem cells that are present in both bone marrow and lymphoid tissues give rise to lymphocytes (Singh, 2002). The earliest cells that can be distinguished under a microscope are the erythroblast (which became erythrocytes), myeloblasts (which become granular leukocytes), lymphoblast (which become lymphocytes) and monoblast (which form monocytes). Bone marrow is the tissue comprising the center of large bones. It is also referred to as the flexible tissue found in the hollow interior of bones. It is termed as a haematopoietic tissue in which new blood cells are formed (Moore and Dalley, 2006). In adults, marrow in large bones produces new blood cells. It constitutes four percent of the total body weight, which is approximately 2.6kg in adult (Jansson, 2008). Not all bones have bone marrow. The wall of the marrow cavity is lined with endosteum. The bone marrow which is highly vascular fixes the marrow cavity and the spaces of spongy bone. The bone marrow has a stroma known as the stroma of the bone marrow which all the tissues are not directly involved in the primary function of hematopoiesis. But still the stroma is indirectly involved in haematopoiesis, since it provides the haematopoietic microenvironment that

facilitates haematopoiesis by the parenchymal cells. For instance, they generate colony stimulating factors, affecting haematopoiesis. The cells that constitute the bone marrow stroma are fibroblast, affecting haematopoiesis. The cells that constitute the bone marrow stroma are fibroblast, macrophages, adipocytes, osteoblasts and blood vessels or sinusoids. Macrophages contribute especially to red blood cell production. They deliver iron for haemoglobin-production (Rubin and Strayer, 2007).

There are two types of bone marrow: Red marrow consisting mainly of myeloid tissue and yellow marrow consisting mainly of fat cells. The red marrow occupies end of the bones, they contain blood vessels and numerous masses of blood forming cells; haemopoietic tissue (Singh, 2002). Red blood cell, platelets and most white blood cells arise in red marrow. Red marrow is found mainly in flat bones, such as the hip bone, clavicle, skull, ribs, vertebrae and scapular and in cancellous (spongy) materials at the proximal ends of long bones like femur and humerus (Moore and Dalley, 2006; Jansson, 2008).

MATERIALS AND METHODS

MATERIALS

Materials used for this study include triple beam balance, 5ml syringe, dissecting set, rubber bowl, hand gloves, sample bottles, microscope, gavage, RBC pipette, counting chamber, Hayem's diluting fluid or RBC diluting fluid, sterile disposable lancet, cover slips, WBC pipette, WBC diluting fluid, dry clean glass slides, Leishmans stain, distilled water, ceder wood oil, heparinized capillary tubes, plastin, haematocrit, centrifuge, razor blade, Haemocytometer, platelet diluting fluid, haematoxylin and eosin stain, other solvents, rat cages, rotary microtome, Mounting medium, and fluoride oxylate container (anticoagulant).

Methods

Plant Materials

Aloe vera gel containing 100% *aloe vera* juice was used for this experiment (a product of forever living products Jos, manufactured under U.S patent number 4446131 & 44465629 and distributed by forever living products 7501 East Mc Cormick PKWY Scottsdale, AZ 85258 U.S.A.

Experimental Animal

This study was carried out in the Department of Human Anatomy, Nnamdi Azikiwe University

Nigeria. Total of 16 male albino rats weighing between 120-150g were obtained from the animal house, department of Human Anatomy, Nnamdi Azikiwe University, Nnewi Campus. The rats were grouped into four (4) groups of A, B, C & D. Group A to C served as the experimental groups while group D served as the control group, which received food and water only. Group A, B and C were administered 250mg/kg, 500mg/kg, and 750mg/kg of the extract, respectively for 14 days. Group D served as the control was given clean water and normal feed. The rats were then sacrificed under anesthesia and the blood obtained was subjected to the biochemical investigation. The bone marrow through the bone was obtained and preserved in formalin for subsequent histopathological processing examination.

Blood samples were obtained from the rat tail by cutting the tip. Caution was taken in obtaining the blood samples. After the tail was cut, the first drop of blood was discarded as this contained tissue fluid. Blood samples of the rats were all analyzed and the parameters were recorded before the experiment began, so as to get the standard count of all the parameters. During the experiment, the blood parameters were taken weekly for the period of two weeks. The blood parameters that were analyzed were red blood cells count, white blood cells count, differential leucocytes count, hemoglobin estimation, estimation of packed cell volume, and platelet count. The aloe vera was administered orally using the intubation method.

BIOCHEMICAL ANALYSIS

Blood collected from the animals by transection of the jugular veins were put into fluoride oxalate container and centrifuged at a rate of 1200 revolutions per minutes (rpm) for 10 minutes. The clear serum obtained was analyzed for blood glucose, serum total calcium, serum inorganic phosphotase, alkaline phosphatase. Using radox laboratory kits at the Department of biochemistry, Nnamdi Azikiwe University Nnewi.

HISTOLOGICAL ANALYSIS

The bone marrow was obtained through bone which was carefully dissected out and fixed in formalin, embedded in paraffin wax and sectioned at 5μm. Sections were stained with hematoxylin and eosin and mounted in canada balsam. Light microcopic examination of the sections was then carried out and micrographs taken using.

STATISTICAL ANALYSIS

Numeric data obtained from the study were expressed as the Mean ± standard error of mean (SEM). Statistical analysis was done by One way analysis of variance (ANOVA) and means compared using Duncan's multiple range analysis (Sokaw and Rolf, 1969). Differences among means of control and treated groups were determined using statistical package for social sciences (SPSS) version 23. A probability level of less than 5% ($P< 0.05$) was considered significant.

RESULTS

SUB ACUTE TOXICITY

Table 1: Effect of *aloe vera* on red blood cell in Wistar albino rats

Parameter			Treatment in days		
	Dose ($mgkg^{-1}$)	No. Of rats	Day 0	7	14
RBC ($X10^6/mm^3$)	Control	5	4.98±0.28	5.28±0.18	5.24±0.11
	250	5	5.11±0.17	4.46±0.22*	3.95±0.15*
	500	5	4.98±0.08	3.52±0.26*	3.11±0.01*
	750	5	5.02±0.08	3.17±0.20*	2.98±0.07*

Mean ± SD, n=5

*P<0.05 Significant decrease compared to control

Treatment of rats with various doses of the aloe vera showed various effects. The Red blood cell counts of rats treated with aloe vera were observed to significantly ($p<0.001$) decrease during the first seven days of treatment. The mean decreased value at day seven of treatments were 4.46 ± 0.22, 3.52 ± 0.26 and 3.17 ± 0.20 for groups treated with 250, 500 and 750mgkg-1 of aloe vera respectively. However, from day 14 of treatment, the RBC counts decreased until the termination of the administration The mean RBC counts of the control group at day zero (o) was 4-98 ± 0. 28 x $10^6/mm^3$ and at day 14 of treatment it was 5.24 ± 0.11x $10^6 mm^3$ (Table 1).

Table 2: Effect of *aloe vera* on white blood cell in wistar albino rats

Parameter	Treatment in days

	Dose ($mgkg^{-1}$)	o. Of rats	Day 0	7	14
WBC ($X10^3/mm^3$)	Control	5	16.52±0.52	8.88±0.30	8.93±0.36
	250	5	16.40±0.68	18.40±0.49*	20.50±0.58*
	500	5	16.12±0.64	19.06±0.70*	21.86±0.57*
	750	5	16.08±0.73	22.56±1.40*	25.60±1.51*

Mean ± SD, n=5

*P<0.05 Significant decrease compared to control

The white blood cells counts of various groups of rats treated with the aloe vera is shown in Table 2. The results shows that there was significantly (P<0.001) increase in WBC in the first seven days of treatment. However, the white blood cells continue to increase significantly (P<0.001) to the 14^{th} day of treatment (Table 2). The observed leucocytosis was pronounced in the groups treated with the different doses of the aloe vera i.e. 250,500 and 750$mgkg^{-1}$ of the aloe vera doses.

Table 3: Effect of *aloe vera* on packed cell volume in Wistar albino rats

Parameter	Treatment in days				
	Dose ($mgkg^{-1}$)	No. Of rats	Day 0	7	14
PCV (%)	Control	5	47.40±1.82	46.20±1.30	46.60±1.14
	250	5	45.80±1.30	43.00±1.23*	40.20±0.84*
	500	5	46.20±1.30	40.60±1.14*	39.20±0.84*
	750	5	47.00±1.00	39.20±0.84*	39.20±1.64*

Mean ± SD, n=5

*P<0.05 Significant decrease compared to control

The administration of aloe vera decreased the packed cell volume (PCV) values of the treated rats in the first seven days of treatment (Table 3). The packed cell volume values of treated rats however, decreased from day 14 of treatment. The mean packed cell volume values were 40.20$\pm$ 0.84, 39.20 $\pm$ 0.84 and 39.20 $\pm$ 1.64% in the groups treated respectively at 250, 500 and 750$mgkg^{-1}$ aloe vera doses. The packed cell volume of the control ranged throughout the period of study.

Table 4: Effect of *Aloe Vera* on haemoglobin concentration (Hb) in Wister albino rats

Parameter	Treatment in days

	Dose ($mgkg^{-1}$)	No. Of Rats	Day 0	7	14
Hb (g/dl)	Control	5	10.38±1.06	8.30±0.45	9.12±0.21
	250	5	10.86±0.39	9.04±0.15*	9.62±0.30*
	500	5	10.60±0.61	10.30±0.35*	10.14±0.09*
	750	5	10.52±0.36	13.16±0.41*	13.30±0.41*

Mean ± SD, n=5

*P<0.05 Significant increase compared to control

The mean haemoglobin concentration (Hb) (Table 4) increased (p<0.001) from the pretreatment values of 9.04± 0.15, 10.30 ± 0.35 and 13.16 ± 0.41gldl respectively in groups treated with 250,500 and 750$mgkg^{-1}$ of the aloe vera to 9.62± 0.30, 10.14± 0.09, and 13.30± 0.41g/dl at day 14 of treatment. The mean haemoglobin values of the control group ranged from 10.3 ± 1.06 to 9.12 ± 0.21gldl.

Table 5: Effect of aloe vera on platelets count in Wistar albino rats

Parameter					Treatment in days
	Dose ($mgkg^{-1}$)	No. Of rats	Day 0	7	14
Platelets ($X10^3/mm^3$)	Control	5	163.0±6.71	161.0±10.84	155.0±3.54
	250	5	159.7±9.38	186.0±4.18*	203.0±8.37*
	500	5	156.0±9.62	208.0±0.84*	238.2±5.81*
	750	5	162.0±8.37	240.0±1.23*	262.0±9.75*

Mean ± SD, n=5

*P<0.05 Significant decrease compared to control

The platelets count of the various groups of rats treated with the aloe vera is shown in Table 5. The result shows that there was significant (p <0.001) increase in platelets count from day seven to 14^{th} day of treatment. The observed thrombopoiesis was more pronounced in all the groups treated with various doses. While the platelets of the control ranged throughout the period of study.

Table 6: Effect of aloe vera on neutrophils in Wistar albino rats

Parameter					Treatment in days
	Dose ($mgkg^{-1}$)	No. Of rats	Day 0	7	14

Neutrophils (%)	Control	5	31.0±1.00	36.6±1.52	36.0±1.41
	250	5	31.0±1.14	32.0±1.23*	31.0±1.00*
	500	5	30.4±1.14	29.8±1.48*	31.0±1.41*
	750	5	30.6±1.34	30.6±1.34*	30.6±0.89*

Mean ± SD, n=5

*P<0.05 Significant decrease compared to control

The differential leucocytes count DLC of the various groups of rats treated with aloe vera were shown in Table 6-9. Table (6) shows in the mean values of neutrophils. There was significant decreases ($p<0.001$) in neutrophils. The mean values were 32.0 $\pm$ 1.23, 29.8$\pm$ 1.48 and 30.6$\pm$ 1-34% in groups treated with 250,500 and 750mgkg^{-1} at day seven of treatment. The observed decrease at day 14 of treatment was 31.0 $\pm$ 1.00, 31.0$\pm$ 1.41 and 30.6$\pm$ 0-89% (table 6).

Table 7: Effect of aloe vera on monocytes in Wistar albino rats

Parameter				Treatment in days	
	Dose (mgkg^{-1})	No. Of rats	Day 0	7	14
Monocytes (%)	Control	5	10.4±1.14	10.60±0.89	10.20±0.84
	250	5	9.40±1.52	9.80±0.45	9.20±1.30
	500	5	9.60±0.89	10.6±0.89	10.00±0.00
	750	5	10.0±1.41	9.40±1.52	9.40±0.89

Mean ± SD, n=5

*P<0.05 Significant decrease compared to control

Table 8: Effect of aloe vera on eosinophils in Wistar albino rats

Parameter			Treatment in days		
	Dose ($mgkg^{-1}$)	No. Of rats	Day 0	7	14
Eosinophils (%)	Control	5	9.20±0.45	9.00±1.00	9.80±1.10
	250	5	9.80±0.84	7.80±1.30	9.60±1.14
	500	5	9.80±0.84	9.00±1.87	8.60±1.14
	750	5	9.20±0.84	9.40±0.55	9.20±0.84

Mean ± SD, n=5

*P<0.05 Significant decrease compared to control

The mean values of monocytes showed no significant changes. The results were shown in Table 7.

The eosinophil values of rats treated with aloe vera at various doses of treatment showed no significant changes in mean value (Table 8).

Table 9: Effect of aloe vera on lymphocytes in Wistar albino rats

Parameter			Treatment in days		
	se ($mgkg^{-1}$)	o. Of rats	Day 0	7	14
Lymphocytes (%)	Control	5	49.80±0.84	52.80±2.78	54.00±1.00
	250	5	49.80±1.48	50.40±0.55	50.00±0.71*
	500	5	49.80±0.84	50.60±0.55	50.40±0.55*
	750	5	49.60±0.55	50.60±1.52	50.80±0.84*

Mean ± SD, n=5

*P<0.05 Significant decrease compared to control

The mean lymphocytes count (Table 9) decrease from the pretreatment values of 49.89 $\pm$ 1.48, 49.80$\pm$ 0.84 and 49.60$\pm$ 0.55%, respectively in groups treated with 250, 500 and 750$mgkg^{-1}$ of the aloe vera to 50.00$\pm$ 0.71, 50.40 $\pm$ 0.55 and 50.80$\pm$ 0.84% at day 14 of treatment (table 9). The mean lymphocytes of the control group ranged from 49.80 $\pm$ 0.84 to 54.00 $\pm$ 1.00%.

Table 10: Effect of aloe vera on some serum biochemistry in Wistar albino rats

Dose ($mgkg^{-1}$)	Parameters			
	Ca^{2+} (Mmol/L)	Inorg. Phos. (Mmol/L)	Alk. Phos. (IU/L)	Glucose (Mmol/L)
Control	0.98±0.08	3.58±0.13	60.00±12.35	2.48±0.19
250	1.14±0.27	3.64±0.09	68.20±3.03	2.20±0.10
500	0.92±0.08	3.60±0.19	59.60±1.14	2.24±0.21
750	0.82±0.16	3.58±0.19	55.20±7.26	2.38±0.08

Mean ± SD, n=5

*P<0.05 Significant decrease compared to control

The effects of aloe vera on some serum biochemistry (Calcium, inorganic phosphorus, alkaline phosphatase and glucose) shows no significant changes in all the various doses administered. The mean values were shown in Table (10).

3.2 HISTOPATHOLOGY

The bone marrow of rats treated with 250 $mgkg^{-1}$ of the aloe vera showed mold fatty changes, reduced erythroid series (fig. 2). Treatment of rats with 500$mgkg^{-1}$ body weight of the aloe vera resulted in lymphocytic leukaemia (fig. 3). Rats treated with 750$mgkg^{-1}$ body weight showed severe oedematous, reduced erythroid series and moderate plasma cells in the bone marrow (fig. 4). The bone marrow of the control group showed normal haematopoietic cells, numerous red cells and mega karyocytes (fig-1)

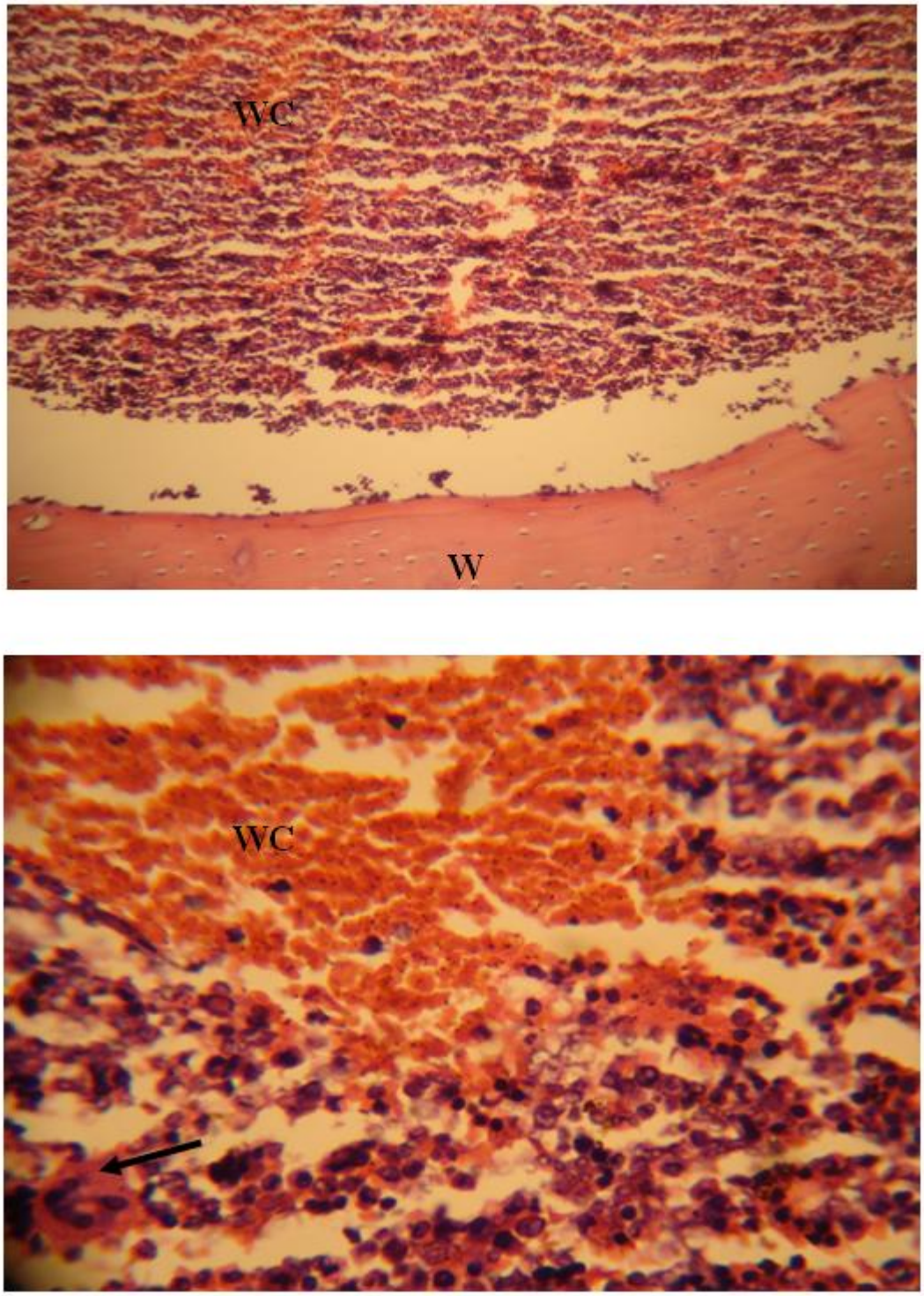


Fig 1A&B: Photomicrograph of control rat bone marrow showing numerous haemapoietic erythroid series (WC), bone (W) and megakarycytes (arrow) H&E Ax100& Bx400.

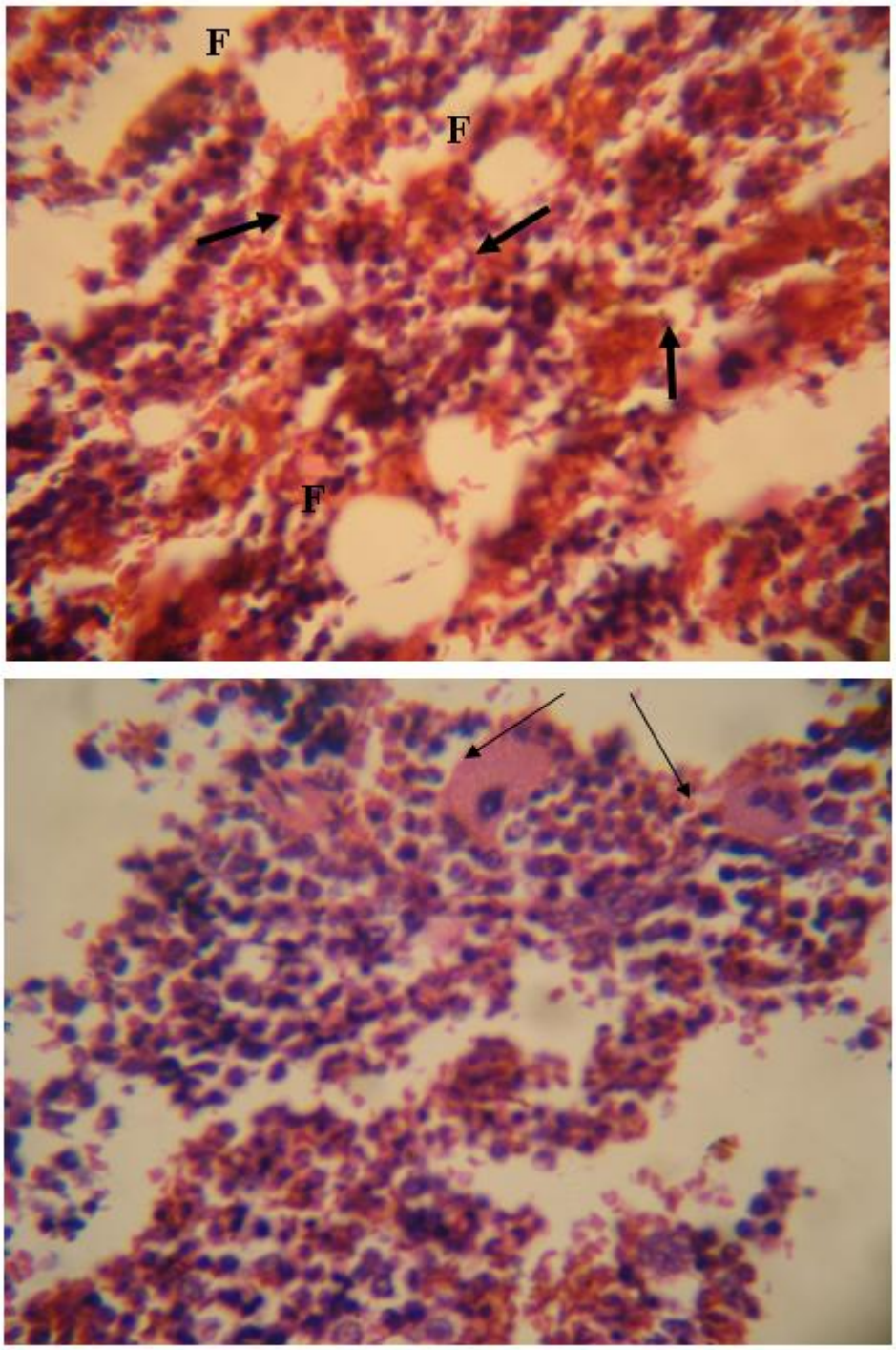


Fig 2A&B: Photomicrograph of rat bone marrow treated with 250mgkg^{-1} of extract showing fatty tissues (F), reduced erythroids cell series, megakaryocytes (arrows) H & E x400.

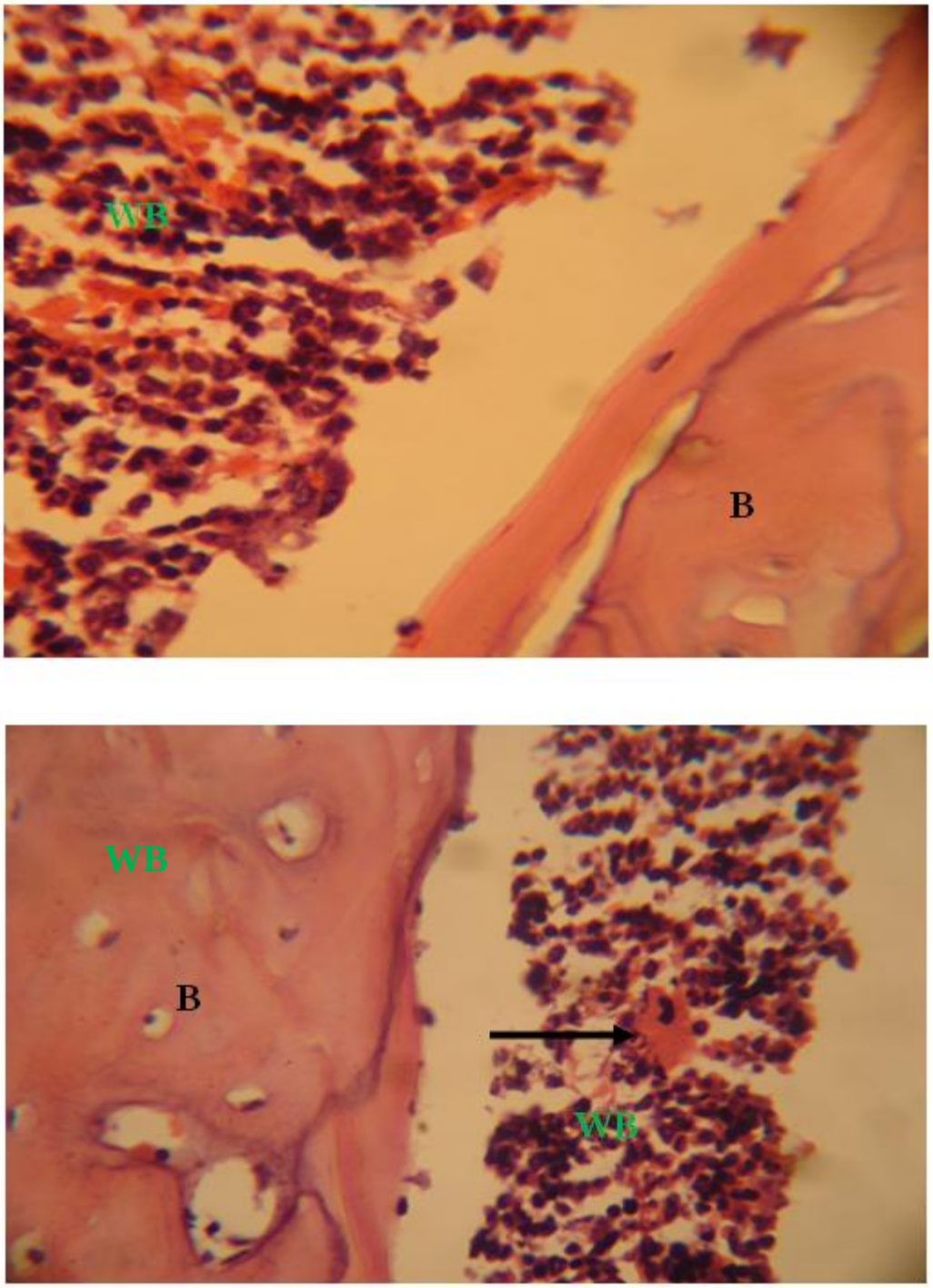
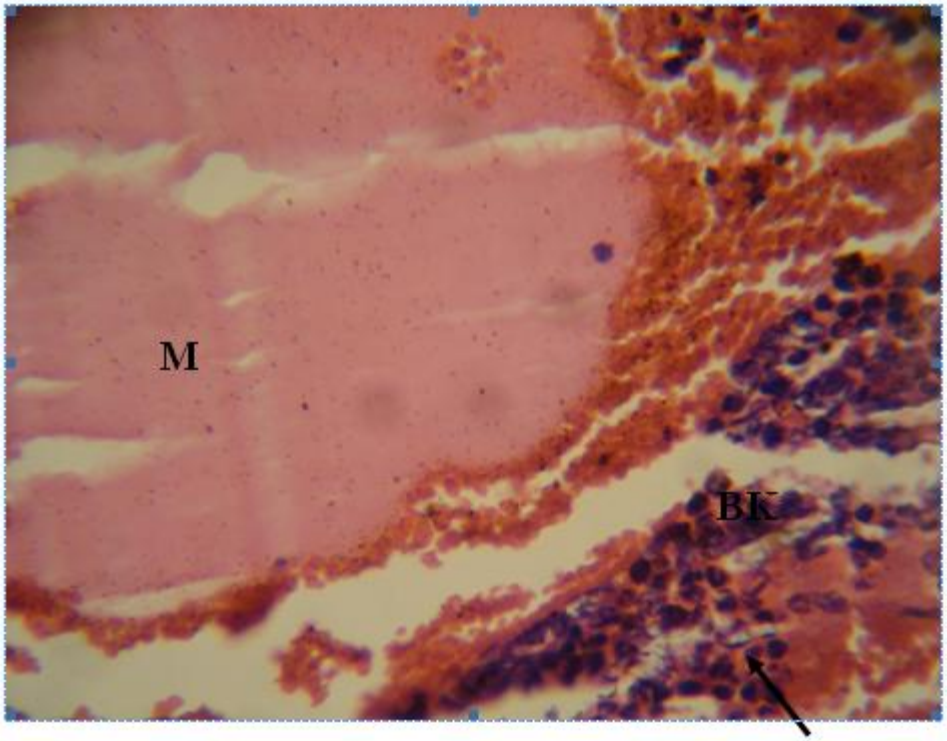


Fig 3A&B: Photomicrograph of rat bone marrow treated with 500mgkg^{-1} of extract showing mild lymphocytic leukaemia (green WB), bone (B) and megakaryocytes (arrow) H & E x400.


M
BK

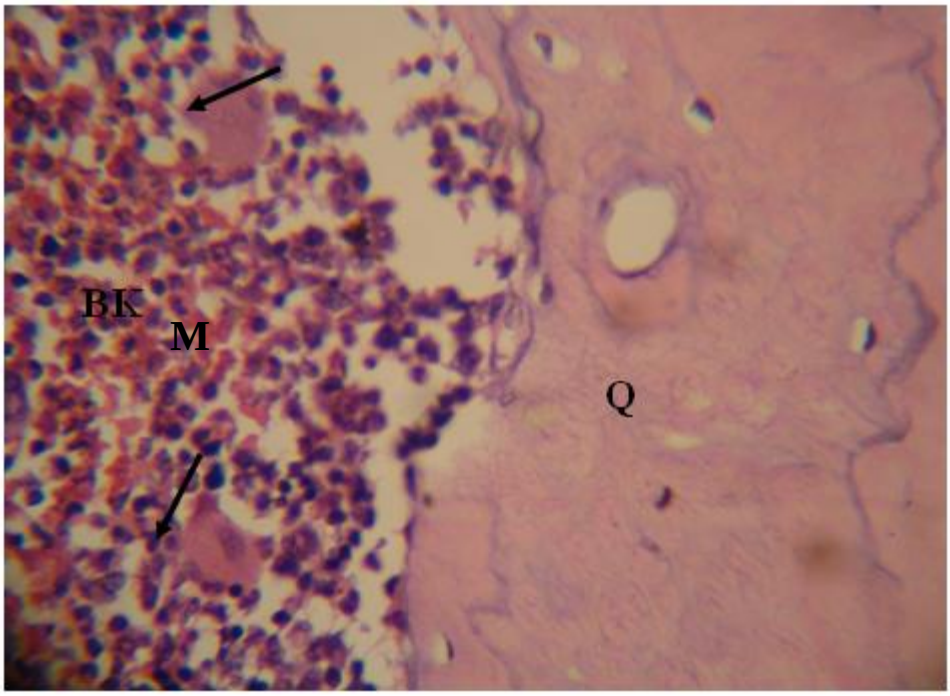

BK
M
Q

Fig 4A&B: Photomicrograph of rat bone marrow treated with 750mgkg^{-1} of extract showing a large area of edema (M), reduced erythroids series (BK), bone cement layer (Q) and moderate plasma cells (arrows) H & E x400.

DISCUSSION AND CONCLUSION

DISCUSSION

Most effects of medicinal plants are mainly due to their chemical composition. The chemical analysis of the aloe vera showed that it contains Barbaloins and Nataloins. (Springboard, 2004).

The experimental groups, showed decrease in RBC count, (2.98-5.11 cells/mm^3) compared to the base line values of RBC count in the groups ranged from 4.5-5.5 cells/mm^3 in males and 4-0-5m cells/mm^3 in females, throughout the period of experiment (14 days) after each day of administration of aloe vera at varying doses of 250mg/kg, 500 mg/kg and 750mg/kg. This is statistically significant ($p<0.001$). The base line values obtained in this study is in agreement with a study carried out by David (2004) and Oyewale et al (1981) in white albino rats and Africa giant rats respectively which range from 4.5-6.5m cells/mm^3 in M and 4.0-5.0m cells/mm^3 in F. This decrease is because it was observed that aloe vera stimulate bone marrow to produce abnormal circulation of red blood cells in the system. The study also decreases in the packed cell volume (PCV) (39.20-45.80) % values which are statistically significant ($p<0.001$). This decrease was observed in the experimental group at all the doses of aloe vera 250,500, and 750mg/kg. The decrease was however more pronounced in group II (40.60 and 39.20) after the experiment, it is statistically significant ($p<0.001$).

The general increase in white blood cell values recorded in this study could be attributed to the fact that when aloe vera was administered to rats, their body immune system related as if the substance was indeed a foreign body and accordingly produced more white blood cells whose activity are phagocytic in the study. Also this study showed that aloe vera increases or enhances the production of platelets which showed statistically significant increase, this when aggregate to the sites of injury together with the platelet derived growth factor (PDGF), helps in increasing the rate of wound healing (Davis et al, 1989; Singh, 2002).

Furthermore it was also noticed, that the differential counts showed high number of lymphocytes than neutrophils, this is in agreement with the findings of Ogunranti (1994) who observed that African have higher lymphocytes than neutrophils count, this is due to low cholesterol level in Africans. monocytes and eosinophils showed no significant increase or change in the study. Previous studies have shown that monocytes remain only for 24hours at most within the blood vessels after which they migrate into the body tissue to form what is called macrophage (Guyton and Hall, 2000; Singh,

2002).

The bone marrow is the production sites of blood cells. In this study, observing the photomicrograph of rat bone marrow treated with 250mgkg^{-1} of extract (aloe vera) showed fatty tissues, reduced erythroid series and megakaryocytes, the photomicrograph of bone marrow treated with 500mgkg^{-1} showed mild lymphocytic leukaemia and megakaryocytes while that of 750mg kg^{-1} showed a large area of edema and moderate plasma cells, the control group should normal histomorphology of the bone marrow.

CONCLUSION

In conclusion, Aloe vera has positive effect (by increasing the count)on the white blood cells, but decreases the Red blood cells count, packed cell volume counts, which may lead to anaemia in prolong term of ingestion. Aloe Vera stimulates the bone marrow to produce abnormal Red blood cells, but enhance platelet production, also encourage presence of mild fatty tissues in the bone marrow.

Ethical Approval

Animal Ethic committee approval has been taken to carry out this study.

RECOMMENDATION

However, this study is not exhaustive on the effect of aloe vera to the bone marrow and blood parameters; its therefore recommended that further studies on increased doses should be carried out including studies of aloe vera on the spleen.

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