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Effect of *Bryophyllum pinnatum* Aqueous Leave Extract on Some Biochemical and Hematological Parameters in Albino Rats

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ABSTRACT

The study assessed how *Bryophyllum pinnatum* (*Crassulaceae*) leaf extract in water affected the biochemical and hematological parameters of albino rats. Five groups of twenty rats were created: a control group and four treatment groups that received extract at doses of 50, 100, 200, and 400 mg/kg body weight. Alkaloids, flavonoids, tannins, phenols, saponins, steroids, and proteins were all detected by phytochemical analysis; the greatest concentration of phenols was 9.6 ± 0.005 mg/100g, while the lowest was 0.29 ± 0.005 mg/100g. When compared to the control, hematological markers such as hemoglobin, red blood cells (RBC), white blood cells (WBC), and packed cell volume (PCV) did not significantly change. Biochemical examination revealed no discernible alterations in bilirubin, alkaline phosphatase (ALP), or alanine transaminase (ALT). The treated groups did, however, see a dose-dependent drop in albumin and an increase in aspartate transaminase (AST). According to the results, Bryophyllum pinnatum has no toxicological effects on hematological parameters, although elevated AST and decreased albumin may cause mild liver damage at higher dosages. It is advised to conduct more research with larger dosages and longer treatment durations, concentrating on other factors.

Keywords: Albino rats, Toxicity, *Bryophyllum pinnatum,* Biochemical parameters, Hematological Parameters.

INTRODUCTION

Since ancient times, medicinal plants have been utilized to treat human illnesses because they contain chemical components that have therapeutic potential (Ayinde *et al*., 2009). Certain chemical compounds (often secondary metabolites) that have a specific physiological effect on the human body are what give plants their therapeutic value. Nowadays, traditional healing methods are widely employed as supplemental or alternative medicine among people in underdeveloped nations (Kavita *et al*., 2018). *Bryophyllum pinnatum* is a perennial medicinal herb that is widely distributed in Nigeria and is generally referred to as "Never Die." Common names for *B. pinnatum* include mother of thousands, miracle leaf, maternity plant, love plant, air plant, life plant, and leaf of resurrection plant (Plate I). In tropical America, India, China, Australia, and Africa, it has been used to treat a wide range of ailments, including rheumatism, body pain, arthritis, heartburn, skin ulcers, peptic ulcers, diabetes mellitus, microbial infections, and hypertension (Chopra *et al*., 2002 and Ghasi *et al*., 2011).

The plant is especially well-known in Nigeria for its ability to effectively heal wounds and remove an infant's umbilicus. Several biological activities, including

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immunomodulatory, depressant, analgesic, anti-inflammatory, antimicrobial, antitumor, antiulcer, insecticidal, antidiabetic, anticonvulsant, antioxidant, and antihypertensive qualities, were reported in pharmacological studies on *B. pinnatum*. Some of these activities may validate the plant's traditional uses. Numerous active phytochemicals, including alkaloids, triterpenes, glycosides, flavonoids, steroids, bufadienolides, lipids, and organic acids, have also been documented in studies. The plant's varied pharmacological actions have been attributed to these substances (Okwu and Nnamdi 2011; Asiedu *et al*., 2012).

Plate I: *Bryophyllum pinnatum* leafs.

Hematological and biochemical indicators, including bilirubin, total protein, creatinine, PCV, RBC, WBC, alanine amino transferase (ALT), aspartate amino transferase (AST), and others, are biomarkers. As advised by the Clinical and Laboratory Standards Institute, these measures have values that are crucial for evaluating illness, tracking the effectiveness of treatment, and evaluating the results of clinical studies (Wanye *et al*., 2008). Normal levels or concentrations for the cells or chemicals involved in these processes suggest normal cellular and metabolic activities. These substances or cells can be found in high or low concentrations in disease states (Patrick *et al*., 2018). Therefore, the goal of the current study was to ascertain how *Bryophyllum pinnatum* affected certain biochemical and hematological parameters in albino rats by conducting both qualitative and quantitative phytochemical analyses and examining the impact of the extract on these parameters.

MATERIALS AND METHODS

Plant material

Fresh leaves of *Bryophillum pinnatum* was used for this study.

Animal

Twenty (20) albino rats weighing 90 ± 10 g were obtained from animal house of National Veterinary Research Institute Vom, Jos, Plateau State. All procedures involving the animal experiment were duly conducted with strict adherence to guidelines of the Animal Ethical Committee of the Institute.

Collection and Identification of Plant Material

Fresh leaves of *Bryophillum pinnatum* were collected at Barama in Mubi – North Local Government Area and was identified and authenticated by Dr. Comfort Yusuf Sankem of the Department of Botany, Adamawa State University Mubi.

Preparation of Plant Extract

A bulk of fresh *Bryophyllum pinnatum* leaves sufficient for the study was collected from a grown plant in Barama Mubi North Adamawa State and taken to the research Laboratory of Department of Biochemistry, Adamawa State University, Mubi. The fresh leaves were shade dried at room temperature and was grinded into fine powder. One hundred grams (100 g) of the powder was weighed using weighing balance and was macerated into a round bottom flask containing distilled water and was allowed to stay for 24 hours with frequent agitation until the matter is dissolved, it was then filtered into a sterile container using a

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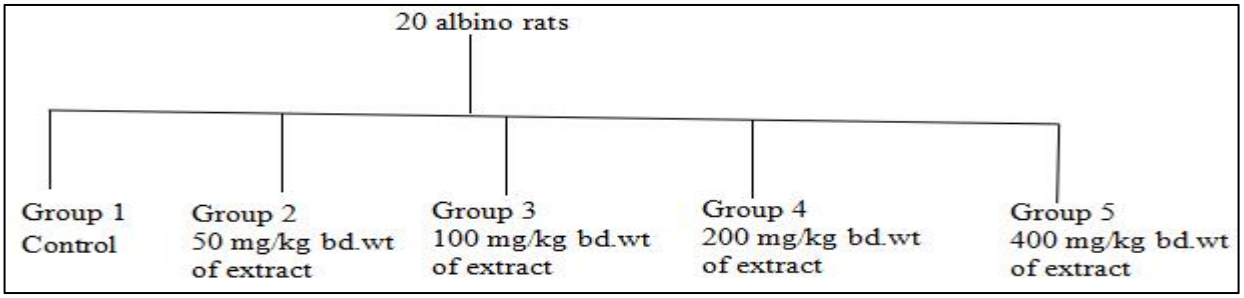
funnel containing Whitman No. 1 filter paper and was concentrated using rotary evaporator at 40^0C. The extract was put in a tight container and stored until use.

Administration of Extract to Animals

Twenty (20) albino rats were used. The rats had free access to water and standard pelletized feed. The extract was orally administered once daily for 14 days.

Experimental Design

The rats were randomly divided into five (5) groups (four each). The groups were treated as follows:



Sample Collection for Biochemical and Hematological Analyses

It was carried out in compliance with Abidemie et al. (2017). After inhaling diethyl ether and having their blood drawn, all of the rats were put to death on the fourteenth day of the experiment. To estimate the packed cell volume (PCV), hemoglobin concentration (Hb), red blood cell count (RBC), and white blood cell count (WBC), a fraction was collected and placed into K+ EDTA bottles. A second part of the drawn blood was put into non-heparinized vials, left to clot, and centrifuged for ten minutes at 3500 rpm. Alkaline phosphatase (ALP), albumin, bilirubin, alanine transaminase (ALT), and aspartate transaminase (AST) levels were among the biochemical markers that were assessed after the serum was separated.

Estimation of Biochemical Parameters

This study was conducted in accordance to the method of Olorunfemi *et al*., (2006). Appropriate commercial kits (Randox Laboratories, U. K.) were used to determine the concentrations of alanine and aspartate transaminases (ALT and AST), alkaline phosphatase, conjugated bilirubin, and albumin.

RESULTS

Table 1: Qualitative phytochemical composition of *B. pinnatum* leaves aqueous extract

Phytochemicals	Inference
Phenols	+
Saponins	+
Tannins	+
Flavonoids	+
Alkaloids	+
Steroids	+
Reducing sugar	+
Protein	+
Glycosides	-

+ = Present; - = Absent

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Table 2: Quantitative phytochemical composition of *B. Pinnatum* leaves aqueous extract

Phytochemicals	Concertation (mg/100g)
Phenols	9.16 ± 0.005
Tannins	2.35 ± 0.005
Flavonoids	3.13 ± 0.005
Alkaloids	2.09 ± 0.010
Steroids	0.29 ± 0.005

Table 3: Effect of *B. pinnatum* aqueous leave extract on some Hematological Parameters

Groups	Treatment mg/kg b.w	PCV (%)	Hb (g/dL)	WBC ($\times 10^3$ cells/mm^3)	RBC ($\times 10^{12}$ /L)
1	Control	$37.33 \pm 1.33^{a,b}$	$12.53 \pm 0.29^{a,b}$	5.80 ± 0.50^{b}	4.47 ± 0.09^{b}
2	50	$36.67 \pm 3.52^{a,b}$	$12.20 \pm 1.17^{a,b}$	5.47 ± 1.07^{b}	$3.97 \pm 0.55^{a,b}$
3	100	$35.33 \pm 1.76^{a,b}$	$11.50 \pm 0.59^{a,b}$	$5.20 \pm 0.30^{a,b}$	$4.17 \pm 0.23^{a,b}$
4	200	38.67 ± 1.76^{b}	13.10 ± 0.49^{b}	$5.00 \pm 0.12^{a,b}$	4.50 ± 0.25^{b}
5	400	40.06 ± 1.15^{b}	$12.44 \pm 0.15^{a,b}$	4.80 ± 0.18^{a}	$4.23 \pm 0.20^{a,b}$

Values are expressed as mean ± standard error of mean (SEM), n=4.Values marked with superscript 'a' are significantly lower at $p < 0.05$ compared with control

Table 4: Effect of *B. pinnatum* aqueous leave extract on some Biochemical Parameters

Treatment mg/kg b.w		AST (U/L)	ALT (U/L)	ALP (U/L)	Albumin (g/dL)	C. Bilirubin (µmol/L)
1	Control	66.00 ± 2.30^{a}	67.33 ± 3.71^{a}	41.98 ± 0.61^{a}	4.17 ± 0.05^{c}	3.77 ± 0.43^{a}
2	50	$68.00 \pm 4.00^{a,b}$	58.00 ± 6.11^{a}	38.60 ± 4.10^{a}	$4.05 \pm 0.13^{b,c}$	3.62 ± 1.02^{a}
3	100	$70.04 \pm 3.52^{a,b}$	60.82 ± 7.21^{a}	40.86 ± 2.49^{a}	$3.78 \pm 0.24^{a,b}$	3.34 ± 0.23^{a}
4	200	$71.67 \pm 2.30^{a,b}$	64.54 ± 2.11^{a}	41.20 ± 1.95^{a}	3.67 ± 0.02^{a}	3.41 ± 0.09^{a}
5	400	78.54 ± 1.33^{b}	64.00 ± 1.17^{a}	42.43 ± 2.14^{a}	3.63 ± 1.04^{a}	3.60 ± 1.28^{a}

Values are expressed as mean ± standard error of mean (S.E.M). Values with different superscript are significantly different at $p < 0.05$ compared with control

DISCUSSION

The presence of phenols, saponins, tannins, flavonoids, alkaloids, steroids, reducing sugar, and protein was shown by the qualitative phytochemical screening of *B. pinnatum's* aqueous leaf extract (Table 1). However, there was no glycoside. According to Table 2's quantitative phytochemical analysis, the leaf extract had the highest concentration of phenols (9.16 ± 0.005 mg/100g), followed by flavonoids (3.13 ± 0.005 mg/100g), and the lowest quantity of steroids. Mostly recognized for their antioxidant properties, flavonoids also exhibit anti-inflammatory, anti-allergic, antibacterial, and anticancer properties (Ekam & Ebong, 2007). Tannins are linked to several biological activities, including anti-inflammatory, anti-asthmatic, anticancer, antidiarrheal, antibacterial, antiallergy, antihypertensive, and cardioprotective properties. Alkaloids may be hazardous because of their stimulatory effects.

According to Jain and Surana (2015), tannins' potent antioxidant and free radical-scavenging properties are primarily responsible for their positive health impacts. Plant substances known as saponins can be found as steroids, triterpene glycosides, or steroid alkaloids. These phytochemicals are known to have anticarcinogenic, immunostimulant, hepatoprotective, hypocholesterolemia, and hypoglycemic effects. Additionally, saponins are thought to have hypocholesterolemia and antifungal properties. It is thought that these effects result from the formation of micellar aggregates in conjunction with bile acids. According to Nyamai *et al*. (2016), saponins

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stop lipid peroxidation-induced hyperlipemia and liver damage.

Table 3 displays the impact of the extract on haematological markers; as compared to the control group, there was no discernible difference in PCV, RBC, WBC, or hemoglobin at $P<0.05$. The degree of harmful or helpful effects of foreign substances, such as plant extracts, on blood and other bodily fluids can be ascertained by evaluating hematological parameters (Ashafa *et al*., 2009). It describes how drugs that are taken relate to the blood (Duru *et al*., 2012; Yakubu *et al*., 2007). Additionally, it can be utilized to describe how chemical substances or plant extracts relate to blood (Yakubu *et al*., 2007). Several hematological parameters that are helpful in evaluating the potential of plant extracts in living systems were examined in the current study. When compared to the control, the test rats' WBC was much higher (Figure 4). This could be a clear proof that rats react normally to chemicals that change their regular physiological processes. The study's observation of leukocytosis, or WBC formation, suggests that the plant extract has an immunosuppressive impact.

According to Korzhuez (1964), haematocrit levels typically range between 30% and 50%. All of the groups' reported PCV values are well within this range, which is considered the usual value. In four groups, there was a positive correlation between PCV values and hemoglobin concentration (Bernard *et al*., 2000). The number of red blood cells (RBCs) in rats' blood has been shown to vary. Table 4 shows the result of the biochemical test. The level of albumin decreased with increase extract concentration as in group 5 is significantly ($p>0.05$) lower compared to the control group, ALT, ALP and bilirubin of the groups at different extract concentration showed no significant difference at $p<0.05$ compared with the control, but there was an increase in AST indicating mild toxicity. Because albumin is synthesized in the liver, a dose-dependent drop in albumin is a powerful sign of liver injury. This fall in albumin levels is caused by a decrease in hepatic activity. However, AST is not unique to the liver; it can also rise in muscles due to a drop in albumin. Since calcium is coupled to albumin and causes liver contraction, a drop in albumin may have resulted in a drop in calcium, which in turn may have caused muscular disorders and raised AST levels.

When it comes to the metabolism of both endogenous and exogenous substances, the liver is the organ most frequently implicated. The hepatic artery transports oxygenated blood from the lungs to the liver, while the portal vein transports blood from the gastrointestinal tract that contains digested nutrients (Yang *et al*., 2014). Because they are secreted into the extracellular space by hepatocytes, the liver enzymes AST and ALT are commonly utilized as indicators of liver injury (Ozer *et al*., 2008). Adipose tissue undergoes peroxidative breakdown due to toxic chemicals, which leads to hepatocyte infiltration (Duru *et al*., 2012).

CONCLUSION

In summary, there has been no toxicological impact of *Bryophyllum pinnatum* on the hematological parameters. However, a rise in AST and a decrease in albumin, particularly at higher doses, indicated a probable mild toxicity on the liver. The effects of the extract at higher dosages and perhaps for a longer duration, as well as on other parameters not included in this study, should be investigated further.

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