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Research Article

Comparative Evaluation of Changes in Haematological Parameters in Female Albino Wistar Rats Treated with Ethanolic Extract of the Leaves and Bark of *Ficus benghalensis* Linn

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ABSTRACT

Ficus benghalensis Linn holds significant trado-medicinal properties, and it is reputed for its therapeutic potential. Various parts of this species are utilized in treating various ailments. This study was designed to evaluate the haematological effects of ethanolic extracts of the leaf and bark of *F. benghalensis* in female Wistar rats. Plant materials were collected from an open field, shade-dried, ground to powder, and thereafter extracted using ethanol, followed by distillation using a Soxhlet extractor, and phytochemical screening was conducted. Twenty-five (25) female rats were procured and divided into five (5) groups of five rats each: Group 1- control, groups 2, 3, 4, and 5 as a high-dose leaf; low-dose leaf; high-dose bark and low-dose bark, respectively. Extracts (800mg/kg; vol: 1.2mL) and 400mg/kg; vol: 0.6mL) for high and low doses were orally administered for 28 days, and the weight of rats was monitored during the period. The blood sample was collected and analysed using an automated haematology analyzer. Results revealed the following bioactive compounds: flavonoids, tannins, phenols, saponins, alkaloids, and steroids. Percentage change in body weight (%) across the groups 1-5: included 7.08%, - 0.79%, 5.45%, 5.05%, and 0.75% respectively. The high-dose leaf extract group showed a significantly ($p < 0.05$) reduced rate of weight gain compared to both the control and the other treated groups. Haematological analysis revealed a non-significant ($p > 0.05$) elevation across these groups, suggesting stimulatory effects on erythropoiesis and thrombopoiesi.

Keywords: Body weight; Erythropoiesis; *Ficus benghalensis*; Heamatology; Phytochemical screening

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INTRODUCTION

The adoption of plant-based medication has led to continual scientific interest and validation in the herbal medicinal input of various plants (Ahad *et al..,* 2021). Plants are considered rich sources of phytochemical ingredients which enable them to have medicinal values (Shakya, 2016). Phytochemical analyses have identified several phytochemicals or bioactive compounds in these species. Herbal drugs are primarily evaluated based on their phytochemical and pharmacological attributes (Ahirwar *et al..,* 2018). These phytochemical compounds are believed to contribute to the plant's therapeutic effects.

Ficus benghalensis Linn, commonly known as the '*Banyan tree*' in English, '*Bot*' in Bengali, and '*Bargad*' in Hindi, has historical ties with diverse cultural and traditional medicinal practices

(Ahirwar *et al.* 2018). The plant is also known by different names in various local languages and among different Nigerian tribes such as "Okpoto" in Yoruba (Ogunlowo *et al.* 2013), "Ebuer" in Tiv and "Ebune" in Idoma. Originating from the Indian subcontinent, this tree has become familiar with various aspects of human life, including religion and healthcare (Gopukumar & Praseetha, 2015). Ethnobotanical records show a rich history of its utilization in folk medicine across diverse cultures (Logesh *et al.* 2023). The Banyan tree falls under the kingdom Plantae, the division Magnoliophyta, and the class Magnoliopsida. Further taxonomic categorization places it in the order Urticales and the family Moraceae (Gopukumar & Praseetha, 2015). *F. benghalensis* is recognized for its spreading branches and aerial roots that develop into secondary trunks (Navale *et al.* 2019). Within the genus *Ficus*, which encompasses a variety of plant species, *Ficus benghalensis* stands out due to its significant religious, cultural, and medicinal uses (Logesh *et al.* 2023). The specific label "*benghalensis*" signifies its historical association with Bengal, India (Virk, 2016). Marked by large, elliptical leaves and fig-like fruits, this tree's morphology stands out in the *Ficus* genus (Ambi & Idrees, 2017).

Ficus benghalensis is rich in phytochemicals and nutrients, making it an important remedy for some of the deadliest diseases (Talukdar & Rahman, 2015). The traditional medicinal uses of *F. benghalensis* are broad (Logesh *et al.,* 2023). In traditional medical systems such as Ayurveda, Siddha, Homeopathy, and Unani (associated with India), it is considered an important source of bio-active compounds that can prevent and cure several human ailments (Singh *et al.,* 2023). The leaves and bark of *F. benghalensis* are particularly noted for their richness in flavonoids, phenols, terpenoids, and terpenes (Naquvi & Ali, 2015). Despite its widespread use in traditional medicines, the plant has not been fully studied for its bio-active constituents, pharmacological and toxicological activities (Logesh *et al.* 2023).

Haematology, studies the blood, its components, and the important roles it plays in maintaining homeostasis within the human body (Keohane *et al.* 2015). Haematological parameters, such as red blood cell count, white blood cell count, haemoglobin concentration, platelets, and hematocrit levels, are important indicators of health and immune function (Car & Seelig, 2022). Alterations in these parameters can provide information on the therapeutic benefits of plant extracts and their safety. For example, an increase in red blood cell count and haemoglobin levels could indicate enhanced oxygen-carrying capacity and improved overall health, whereas significant changes in white blood cell counts could suggest modulations in the immune system (Das *et al.* 2021).

Physicochemical parameters such as weight change are important for understanding the health and metabolic status of an organism (Jensen *et al.* 2021). Monitoring these parameters can help determine the impact of diet and treatments on growth, and overall well-being of the organism (Yoshimura *et al.* 2020). Significant changes in weight could show beneficial or adverse effects of *Ficus benghalensis* extracts on health.

Traditional knowledge, though valuable, often lacks the experimental evidence to support its involvement in modern medical practices. This study aims to contribute to this by providing an examination of the phytochemical, physicochemical and haematological effects of ethanolic extracts of *Ficus benghalensis* leaves and bark in female Wistar rats. Identification of the bio-active compounds through phytochemical screening will provide information on the possible effects of the plant in relation to the observed health effects (Hassan *et al.* 2020).

Some recent research works have studied the pharmacological properties of *Ficus benghalensis*. Ahirwar *et al.* (2018) reviewed the anti-diabetic effects of the bark extract in albino rats, highlighting its potential in managing blood glucose levels. Another study by Imran *et al.* (2021) examined the wound-healing properties of the leaf extract, supporting its traditional uses in treating skin injuries. Furthermore, research by Murugesu *et al.* (2021) reviewed the antioxidant activity of the plant's extracts, providing evidence for its role in mitigating oxidative stress.

Despite advancements in modern medicine, many people in developing countries still rely on traditional healing practices and medicinal plants for their daily healthcare needs due to factors such as the unavailability of modern healthcare, high costs of pharmaceutical drugs, and inadequate healthcare infrastructure. The efficacy of these plants in most cases is without scientific confirmation and remains as 'just traditional claims. There is much, yet largely undocumented, traditional knowledge of herbal remedies used to treat various health and disease conditions (Logesh *et al.,* 2023). One such undocumented traditional practice is the ingestion of an aqueous extract of *Ficus benghalensis* leaf by women in Tarka Local Government Area of Benue State Nigeria, who believe its efficacy in aiding discharge of protracted placenta after childbirth. The specific physiological impact of *Ficus benghalensis*, particularly as it is being applied in the local communities of Tarka,

Benue State, remains questionable. Addressing this by providing valuable scientific information on its effects on weight and heamatological indices on albino Wistar rats is important. The study's findings could contribute to both the community and traditional medicine practitioners commonly known as 'herbalists', creating more understanding of the medicinal attributes of the plant.

MATERIALS AND METHODS

Plant Sample Collection

The bark and leaves of *Ficus benghalensis* Linn were collected from a local open field in Tarka Local Government Area of Benue State. The plant authentication was done at the Department of Biology, Benue State University with identification number 178 by J I WAYA.

Sample Preparation

The leaves and bark of *F. benghalensis* were air-dried at room temperature and ground into a fine powder using a blender (name of manufacturer, country of manufacture). Drying at room temperature helped to retain heat-sensitive phytochemical compounds. Eight hundred (800) grams each of powdered bark and leaf samples were soaked in 2.5 litres of 99% ethanol (C_2H_5OH: analytical grade), and each solution was allowed to stand for 72 hours with occasional stirring. Each of the mixtures was then filtered using a sieving cloth to obtain a clear extract solution. The filtrates were distilled to reclaim ethanol using a Soxhlet extractor. This apparatus allowed for continuous extraction over several cycles, increasing efficiency. The remaining solvent from the obtained extracts after distillation was evaporated using a water bath at 40°C to obtain a crude ethanolic extract. Using a water bath ensured that the extracts were heated gently and evenly, preventing overheating and maintaining the integrity of heat-sensitive bio-active compounds. The extract was stored in airtight containers for further use to preserve the extracted compounds and prevent contamination.

Phytochemical Analysis

The phytochemical screening of both leaf and bark extracts of *Ficus benghalensis* included the tests for alkaloids, flavonoids, tannins, saponins, phenols, and steroids. The phytochemical screening method conducted was in accordance with the screening methods demonstrated by Shaikh *et al.* (2020) with moderations. All chemicals and reagents used were of analytical grade and obtained from the Biochemistry Laboratory, the College of Health Sciences, Benue State University, Makurdi.

Experimental Animal Handling

Twenty-five (25) female Wistar rats were obtained from and housed under laboratory conditions at the Animal House Unit, College of Health Science Makurdi, Benue State University. The rats had an initial weight range of 136.5g-189.5g at day zero (0) of treatment and were housed using a metallic cage in a typical environmental settings with 12 h/12 h light/dark cycles, humidity between 35% and 60%, and temperatures between 25°C and 28°C. They were given unlimited access to water *ad libitum* and were fed commercial feed known as supreme finisher pellets (a standard commercial laboratory rat chow (feed) sourced from Modern Market, Makurdi, Benue State, Nigeria). The rats were allowed to acclimatize for two (2) weeks before the commencement of the experiment. Ethical principles were strictly adhered to while handling the animals. The median lethal dose (LD_{50} = >5000mg/kg body weight) was determined via the method demonstrated by Murugesu *et al.* (2021). The body weight of each rat was recorded using an electronic beam balance at the start of the experiment (day 0) and subsequently at an interval of three (3) days for Twenty-eight (28) days. Changes in body weight were monitored and recorded to evaluate weight gain or loss.

Experimental Design

To assess the effects of the leaf and bark ethanol extract of *F. benghalensis* on the physicochemical and haematological parameters in female Wistar rats, twenty-five (25) Wistar rats of the same stock, assumed healthy, were assigned to five (5) groups of five (5) rats each, under similar body weight ranges before treatment. Group 1 served as the control (received no extract) and was allowed free access to water and food ad libitum. Group 2 received 800mg/kg body weight of the ethanolic leaf extract of *F. benghalensis*. Group 3 received 400mg/kg body weight of the ethanolic leaf extract, Group 4 received 800 mg/kg body weight of the ethanolic bark extract of *F. benghalensis,* and Group 5 was administered 400 mg/kg body weight of the ethanolic bark extract. The animals received daily doses of the respective ethanolic leaf and bark extracts throughout the 28 days of the study. Six (6) grams of each stock extract (leaf and bark) were dissolved in 60 mL of distilled water each, at an interval of three (3) days throughout the experimentation. The volume of administration per extract (leaf and bark) was calculated using the formula:

$$\frac{\text{Dose X Av. BW}}{\text{Conc. X 1000}}$$

Dose = high dose (800 mg/kg body weight) or low dose (400 mg/kg body weight); Av. BW = average body weight in grams; Conc. = concentration of extract to administer with an equivalent of 100; 1000 = Conversion factor to millitres (mls).

Consequently, the high and low dose groups received 1.2 and 0.6 millilitres (mL) per kilogram

body weight of the extracts (leaf and bark) respectively. The extracts were administered orally using gastric gavage once daily for Twenty-eight (28) days.

Blood Collection

After 28 days of treatment with the extracts, the animals were starved overnight, anesthetized with chloroform, and sacrificed. Blood from each animal was collected by cardiac puncture and blood samples from each animal were collected into EDTA tubes. The samples were then sent to Benue State University Teaching Hospital, Makurdi for analysis. Full blood count (FBC) including red blood cell (RBC) count, haematocrit (HCT/PCV), haemoglobin, red blood cell indices, white blood cell (WBC) count, differential white blood cell count, and platelet (PLT) were analyzed using standard laboratory procedures. The haematological parameters were assessed using an automated haematological analyzer, a diagnostic instrument used to perform full blood counts (FBC) and other blood-related tests accurately and fast. It works by aspirating a small volume of blood and passing it through various channels to measure various haematological parameters. The analyzer employs several principles, including electrical impedance (Coulter principle) to count and size cells, and flow cytometry to analyze the physical and chemical characteristics of cells as they pass through a laser beam.

Data Analysis

The statistical analysis was done using the SPSS (Statistical Package for the Social Sciences) version 26.0. The data were analyzed for statistical significance by one–way Analysis of Variance (ANOVA) followed by Tukey's honest significant difference (HSD) post-hoc test to determine the level of significance between groups. The results were expressed as Mean ± SD (Standard deviation). P values < 0.05 were considered significant.

Ethical Considerations

The study adhered strictly to ethical guidelines for the care and use of laboratory animals with ethical clearance (code 'CREC/UGP/123') issued by the Ethical Committee of the College of Health Sciences, Benue State University, Makurdi.

RESULTS

Result of Phytochemical analysis

Table 1 presents the results of qualitative phytochemical analysis of *Ficus benghalensis* leaf and bark extracts.

Effects of *F. benghalensis* on body weight

Results of the body weight of the female Wistar rats administered with high (800 mg/kg) and low (400 mg/kg) doses of ethanolic extracts of *F. benghalensis* leaf and bark are presented in Table 2.

Effects of *Ficus benghalensis* on Haematological Parameters

The result of the effects of *Ficus benghalensis* ethanolic leaf and bark extracts on haematological parameters such as RBC, PCV/HCT, HGB, MCV, MCH, and MCHC in female Wistar rats is shown in Table 3a while results for PLT, WBC, LYM, MONO, and GRAN are shown in Table 3b.

Table 1: Qualitative Phytochemical Screening of *F. benghalensis* Linn leaf and bark extracts

Phytochemical	*F. benghalensis* Leaf Extract	*F. benghalensis* Bark Extract
Alkaloids	+	+
Flavonoids	++	+
Tannins	++	+
Saponins	++	+
Phenols	++	+
Steroids	+	+

KEY: + = Moderately present; ++ = Abundantly present

Table 2: Effects of *F. benghalensis* ethanolic leaf and bark extract on the body weight of female Wistar rats

	Group 1	Group 2	Group 3	Group 4	Group 5
Initial bw (g)	152.60 ± 1.98	177.70 ± 8.53	139.20 ± 1.68	160.40 ± 3.72	146.20 ± 3.19
Final bw (g)	163.40 ± 8.38[a]	176.30 ± 10.14	146.78 ± 8.79	168.50 ± 7.04	147.30 ± 13.97
Change in bw (g)	10.80	-1.40	7.58	8.10	1.10
% Change in bw	7.08	-0.79	5.45	5.05	0.75

Initial body weight and final body weight are expressed as Mean ± SD.

Values marked with (a) differ significantly from the initial body weight (p < 0.05). KEY: BW = Body weight

Table 3a: Effects of *Ficus benghalensis* ethanolic leaf and bark extracts on the red blood cell, hematocrit, haemoglobin, and red blood cell indices in female Wistar rats

GROUPS	RBC (10^{12}/L)	PCV/HCT (%)	HGB (g/L)	MCV (fL)	MCH (pg)	MCHC (g/L)
GROUP 1	6.40±0.28	36.73±2.01	101.33±6.42	57.40±1.42	15.87±0.40	276.67±4.04
GROUP 2	6.68±0.29	39.60±1.93	107.00±4.58	59.30±1.08	15.98±0.38	269.67±5.86
GROUP 3	6.36±0.45	38.10±1.00	104.00±3.61	60.13±4.67	16.46±0.86	274.00±7.00
GROUP 4	6.57±0.26	38.07±0.83	107.67±2.08	58.00±1.08	16.40±0.36	283.00±2.65
GROUP 5	6.74±0.69	40.07±5.63	110.33±12.50	59.30±2.60	16.33±0.25	276.00±8.72

Each value represents mean±SD, N=5

KEY: *RBC= Red blood cell; PCV = Packed cell volume; HCT = Hematocrit; HGB= Haemoglobin; MCV = Mean corpuscular volume; MCH = Mean corpuscular haemoglobin; MCHC = Mean corpuscular haemoglobin concentration; GROUP 1 =Control; GROUP 2 = High dose leaf extract; GROUP 3 = Low dose leaf extract; GROUP 4 =High dose bark extract; GROUP 5=Low dose bark extract*

Table 3b: Effects of *Ficus benghalensis* ethanolic leaf and bark extract on platelets, white blood cells, and differential counts in female Wistar rat.

GROUPS	WBC (109/L)	PLT (109/L)	LYM (%)	MONO (%)	GRAN (%)
Group 1	278.00±70.74	1.34 ±0.38	95.70±4.26	1.73±1.20	2.57±3.09
Group 2	512.33 ±202.40	3.57 ±1.96	96.00±9.44	2.77±2.12	4.23±7.33
Group 3	389.67 ±94.80	5.21 ±6.55	97.40±1.51	1.20±0.92	1.03±1.14
Group 4	621.33 ±46.49	1.84 ±0.58	98.73±0.90	1.10±0.61	0.17±0.29
Group 5	447.67 ±145.18	12.40 ±18.40	97.17±2.31	1.60±0.72	1.23±1.63

KEY: PLT=Platelet; WBC= White blood cell; LYM=Lymphocytes; MID= Monocytes; GRAN = Granulocytes; GROUP1= Control; GROUP 2= High dose leaf extract; GROUP 3= Low dose leaf extract; GROUP 4= High dose bark extract; GROUP 5= Low dose leaf extract

DISCUSSIONS

This study evaluated the qualitative phytochemical constituents of the leaves and bark ethanolic extracts of *Ficus benghalensis*. Both leaves and bark revealed the presence of bioactive compounds including alkaloids, saponins, flavonoids, tannins, phenols, and steroids similar to the phytochemical screening studies of Govindan & Francis (2015) and Rajalakshmi & Tamilarasi (2019), and reviews of Naquvi & Ali, (2015), Logesh *et al.* (2023), Murugesu *et al.* (2021), Ahirwar *et al.* (2018), Khaliq (2017), Gopukumar & Praseetha, (2015), Talukdar, & Rahman, (2015), Navale *et al.* (2019), Ambi & Idrees, (2017). The biological activities of these compounds suggest a contribution to the observed impact of *F. benghalensis* on the weight and haematopoietic system in the rats, as seen in studies by Restivo *et al.* (2022), and Rajashekaraiah *et al.* (2023). Behl *et al.* (2021), also reported the influence of these varying bioactive compounds on improved thrombopoietic, erythropoietic and immune activities.

The body weight results showed a significant increase in body weight in the control group by 7.08%, indicating normal growth in the absence of any extract treatment. The high-dose leaf extract group resulted in a decrease in body weight (-0.79%), which could be a potential metabolic toxic effect that could inhibit weight gain. This aligns with studies where high doses of certain plant extracts sometimes exert effects, leading to reduced appetite or nutrient absorption by the work of Cristina *et al.* (2015), which reported bioactive compounds for the prevention and treatment of weight gain. This could explain the weight loss observed in this study. The low-dose leaf and high-dose extract groups showed a modest weight gain of 5.45% and 5.05% respectively. The effect was smaller compared to the control group, which could be that while both extract treatments may show no adverse effect on growth, they could also have mild toxic effects, potentially impacting weight gain as the observed effect in the high-dose leaf group. The low-dose bark extract resulted in minimal weight change (0.75%), which could be an indicator of a lesser effect on weight gain promotion. The leaf extract, particularly at a high dose (group 2), led to weight loss, which could mean possible toxic effects at higher concentrations. This observation aligns with a study by Mounanga *et al.* (2015) which reported that high doses of administration influence the degree of toxicities. In contrast, the low dose allowed for modest weight gain, which could indicate a safer range for metabolic activities. The bark extract group, however, showed fewer effects on body weight change, with high doses having a positive effect on weight change. The low-dose bark extract showed minimal weight gain, which could indicate a dose-dependent effect

where higher concentrations mitigate lower rates of weight gain observed at lower concentrations. This result indicates that *Ficus benghalensis* ethanolic extracts can affect body weight in female Wistar rats, with leaf extracts showing potential for weight reduction and bark extracts promoting weight gain. These findings highlight the importance of optimal doses for therapeutic applications of *F. benghalensis*. Further studies are important to examine the long-term effects of the extracts on body weight and overall health and identify potential toxic compounds and their safe concentrations.

The results on the effect of *Ficus benghalensis* ethanolic leaf and bark extract on RBC, HGB, PCV, and RBC indices in female Wistar rats as seen in Table 3a showed a level of stabilized RBC and HGB counts aligning with the pharmacological studies on various parts of *F. benghalensis* impacting on human red blood cell membrane (HRBC) stabilization reported by Ahirwar *et al.* (2018). This observation is also similar to a study by Raisagar *et al.* (2019) where RBC membrane stabilization in an inhibition of RBC hemolysis in an *in vitro* wound healing model in rats was reported as influenced by hydro-alcoholic and ethanolic bark extracts of *Ficus benghalensis*.

Both leaf and bark extract groups slightly increased RBC counts, HGB, and PCV compared to the control, suggesting a potential erythropoietic effect, an observation that can be compared to an observed increase in HGB and PCV levels in anemic rats administered ethanolic bark extract of *Ficus benghalensis*, as reported by Patel *et al.* (2020). The report suggested that the extract promotes erythropoiesis (production of RBCs). All treatment groups showed similarly increased PCV and HGB levels compared to the control, with the low-dose bark extract (Group 5) showing the highest increase. The leaf extract, especially at high doses (Group 2), increased RBC, PCV, and HGB, suggesting enhanced erythropoiesis and haemoglobin synthesis. The high-dose leaf extract group showed higher increases in HGB and PCV compared to the low dose, which could indicate a dose-dependent effect where higher concentrations might have more haematological benefits. However, the bark extract groups, particularly at a low dose (Group 5), had more effects on RBC count, PCV, and haemoglobin levels. This may be an indicator of potential benefits in treating anemia or boosting red blood cell production. The low dose bark extract group had a more pronounced effect on RBC count, PCV and haemoglobin levels than the high dose group. This maybe an indicator that lower concentrations might be more effective for haematological improvement without being potentialy toxic. The MCV values showed slight increases in all treatment groups compared to the control. The high dose leaf extract (Group 2) and high dose bark extract (Group 5) showed lower MCV compared to the low dose of the respective groups, which could indicate that high doses of these extracts may effectively improve red blood cell size and oxygen transport but with potential toxic effect. The MCH increased in all extract-treated groups, with the low dose leaf extract (Group 3) showing the highest value across all groups and in comparison, to the high dose leaf extract group, suggesting a potential toxic effect of the extract at a higher dose. There is an observed dose-dependent effect in both high and low dose bark extract groups. The MCHC levels varied slightly, with the high dose bark extract (Group 4) showing the highest MCHC value. This suggests that the high-dose bark extract might enhance haemoglobin concentration within cells, possibly improving oxygen transport efficiency. The slight decrease in MCHC in the high-dose leaf extract group (Group 2) compared to the low-dose leaf extract group (Group 3) could indicate possible toxic effects at higher concentrations, potentially affecting haemoglobin concentration within cells. However, all extracts showed overall positive effects on red cell parameters without significant adverse effects suggesting that the doses used were generally safe.

The results on the effect of *Ficus benghalensis* ethanolic leaf and bark extract on PLT count, WBC, and differential counts in female Wistar rats in Table 3b showed dose-dependent increases in platelet counts across all treatment groups compared to the control. The high-dose bark extract (Group 4) had the highest platelet count, suggesting that it may have stronger effects on platelet production or activation. This observation presents similar activity in a study by Ambreen *et al.* (2019) which reported an enhanced prothrombin time and activated partial thromboplastin time on human plasma treated with methanolic bark extract of *F. benghalensis*. This increase in platelet counts could be indicative of improved blood clotting activity or a response to potential stress or injury by *Ficus benghalensis* as seen in a study by Rajashekaraiah *et al.* (2023) which reported platelet increase due to the antioxidant activity of the plant in drug-induced thrombocytopenia. The WBC counts varied across groups with a general increase compared to the control group. This observed increase is in accordance with a study by Behl *et al.* (2021) which recorded increase in WBC counts, bone marrow cellularity, antibody, phagocytosis and lymphocytes, influenced by the biological activities of the plant. Lymphocyte percentages

were higher in the extract-treated groups compared to the control which can also be compared with the enhanced immune responses in the study reported by Behl *et al.* (2021). The high-dose bark extract (Group 4) showed the highest percentage. This could indicate enhanced immune or response to anti-stress activity of the bark of this plant. A relatable study by Moustafa (2020) shows the anti-stress potential of aqueous, ethanolic, and ethyl acetate bark extracts of *F. benghalensis* which showed a decrease in leucocytes and eosinophils, showing anti-allergic and anti-stress potential in asthma by milk-induced leucocytosis and eosinophilia. Granulocyte and monocyte percentages varied, with the high dose leaf extract (Group2) showing only high counts compared to the control group. This observation aligns with a study by Murugesu *et al.* (2021), which reported that hydroethanolic (butanol fraction) of leaf extract stimulated neutrophils to phagocytic action. This could be an indicator of a potential increase in neutrophils or an inflammatory response at higher doses of the leaf extract. Other studies by Bhanwase & Alagawadi (2016) and Khaliq (2017) reported that hydroalcoholic leaf extract of *F. benghalensis* and its four fractions (n-hexane, n-butanol, chloroform, and water) showed stimulation of immune activity through phagocytosis of killed *C.albicans*, indicating an enhanced immune response. The leaf and bark extracts generally may have immuno-modulatory effects similar to the studies of some authors, including Aphale *et al.* (2021), Bhanwase & Alagawadi (2016), Crossia *et al.* (2016), Khaliq (2017), Murugesu *et al.* (2021), Behl *et al.*., (2021) and others, which reported various extracts of the leaves and bark in suppressing or stimulating immune activities due to the bioactive compounds found in the extracts.

The effects of *Ficus benghalensis* extracts on platelets,WBC, and differential counts vary by dose and type of extract. The findings in the haematological parameters could be that while higher doses of *Ficus benghalensis* extracts can show more haematological improvements in some parameters, they may also exceed beneficial levels where adverse effects occur. Low doses often provide a balance between efficacy and safety in accordance with studies on pharmaco-dynamics and pharmaco-kinetics by Linsay *et al.* (2014). This increases therapeutic benefits while reducing potential toxicity.The discussion includes a consideration of potential toxic effects or safety of the leaf and bark extracts on the rats, and as such, the observation that low doses of *Ficus benghalensis* extracts have a more pronounced effect on certain haematological parameters compared to high doses. These potential toxic effects could be reflected in higher doses or negative feedback mechanisms. High doses of plant extracts can sometimes exert toxic effects similar to reports by Cristina *et al.* (2015). These toxic effects could be indicative of the observed adverse impacts. In contrast, low doses may not reach the level of these negative effects, allowing for the beneficial properties of the extracts. This observation aligns with the biphasic dose-response relationship study of Nweke & Ogbonna (2017). The body also uses feedback mechanisms to maintain homeostasis. This is in line with studies by Liu *et al.* (2018), reporting negative feedback mechanisms in nodulation homeostasis, and Goedeke *et al.* (2021), reporting the regulation of cholesterol biosynthesis by an anti-sense inhibitor-induced negative feedback mechanism. High doses of active compounds could trigger negative feedback mechanisms that reduce further production or activity of blood cell parameters. Low doses may not activate these pathways, allowing for haematological benefits. Furthermore, there are some observed contrasting effects of low doses in some parameters like the control group. This puts a question in such observed dose effects in line with the study by Murado & Vazquez, (2007).

CONCLUSION

This study provided information on the phytochemical content of the leaf and bark extracts *F. benghalensis*, revealing the presence of flavonoids, tannins, alkaloids, phenols steroids, and saponins. Equally in terms of physicochemical parameters, notable changes were observed in weight suggesting metabolic alterations by the extracts. The findings noted the potential therapeutic benefits of these extracts in enhancing haematopoiesis and maintaining overall health. The extracts showed improvements in red and white blood cells, platelets, haemoglobin levels, and hematocrit values. These effects are likely linked to the phytochemical content of the plant extracts, which may enhance erythropoiesis, thrombopoiesis and modulate immunity. However, the lack of long-term studies limits the current understanding of these effects. Additionally, the variations in extraction methods pose another challenge.

Despite the findings regarding the physicochemical and haematological effects of *Ficus benghalensis* extracts, several gaps remain. First, there is a paucity of information in understanding the long-term safety and efficacy of these extracts. Most studies have focused on short-term administration and its immediate effects on various physiological parameters. Long-term studies are needed to assess potential chronic toxicity and other long-

term health effects. Further studies aimed at identifying potential toxicity levels, optimal and safe dosages of *Ficus benghalensis* should be carried out to avoid poisoning from the unregulated consumption as practiced by women in Tarka Local Government Area of Benue State. Studies to examine the efficacy of *Ficus benghalensis* extracts relative to other well-known medicinal plants should be conducted. This could help substantiate *Ficus benghalensis* in terms of herbal medicine and identify its benefits when it is combined with other herbs.

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