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Original Research Article

Assessment of Oral Acute Toxicity of Thai *Dendrophthoe pentandra* (L.) Miq. Leaf Extracts in Wistar Rats

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ABSTRACT

Southeast Asian nations, particularly Thailand, have long employed the leaf portions of *Dendrophthoe pentandra* as traditional medicines. However, there is no report on their safety assessment. This study sought to determine the acute toxicity of *Dendrophthoe pentandra* leaf extracts in male and female Wistar rats. The OECD 420 guidelines were followed in performing the acute toxicity investigation. The extracts were given orally to male and female Wistar rats once at doses of 5, 50, 300, and 2,000 mg/kg. Within 24 hr of dosing and up to 14 days following the tests, the acute toxicity symptoms and mortality rates were recorded. The body weights were measured in week 0, 1 and 2. At the end of the experiments, internal organ weights were recorded. Additionally, the blood biochemistry, liver and kidney histology, and hematological parameters were investigated. Body weight and relative organ weight were unaffected by any of the extract doses. All of the treatments cause the rats to gain weight. Rats given the extracts orally showed no changes in hematological parameters. All experimental groups' rat lipid profiles were comparable. Rats in all experimental groups had similar blood biochemical values. Additionally, liver and kidney tissues did not contain any signs of inflammation. There was no difference in the histology of liver and kidney in rats treated with the extracts. The results showed that *Dendrophthoe pentandra* leaf extracts were at the dose studied. It was advised to consume *Dendrophthoe pentandra* leaf extracts at dose of more than 2,000 mg/kg..

***Keywords*:** *Dendrophthoe pentandra*, Leaf extracts, Acute toxicity, Rats.

Introduction

A hemiparasitic plant known as *Dendrophthoe pentandra* (L.) Miq. (Loranthaceae) can be found on a variety of tree hosts. It is generally found in Southeast Asia and the Asian continent. It was discovered on cultivated hosts in Thailand that belonged to 24 families, 40 genera, and more than 40 species.[1] Flavonoids, saponin, and tannin are present in *Dendrophthoe pentandra* extracts. In the aqueous, ethyl acetate, and n-hexane fractions, saponin, polyphenols, alkaloids, flavonoids, and terpenoids are present.[2] The secondary metabolite in the leaf extracts of this plant, including quetin-3-*O*-rhamnoside, was determined to be flavonoids.[3] The phytoprogesterone and its derivatives are also present.[4,5]

According to earlier investigations, *Dendrophthoe pentandra* has a variety of biological and pharmacological effects. The leaf extract of *Dendrophthoe pentandra* in three different host displayed total flavonoid and phenolic content and antioxidant activity.[6] In a rat model, the leaf extract of this plant exhibited hepatoprotective, antihyperglycemic, and anti-diabetic properties.[7] *Dendrophthoe pentandra* leaf extracts in aqueous and ethanolic forms exhibit antidiabetic action and are non-toxic.[8] In CCl_4-induced hepatotoxic rats, the extracts show antioxidant and hepatoprotective properties.[9]

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In rats with induced hypertension, the leaf extract also demonstrated a hypotensive effect.[10] *Dendrophthoe pentandra* extracts also have an impact on the width of the brain's white matter area and reduce the amount of cell necrosis.[11] In hypertensive rats, the combination of *Dendrophthoe pentandra* leaf extract from two hosts (tea and mango) decreased brain cell necrosis in the white matter.[12] *Dendrophthoe pentandra* extract ameliorates TNBS-induced colitis through controlling $CD4^+$ T cells in mesenteric lymph nodes by histological alteration and preventing IL-17generation.[13] Additionally, it causes p53 expression in colitis-associated colon cancer and suppresses growth, inflammation, and proliferation.[14] *Dendrophthoe pentandra* leaf extract inhibit the aging process by increasing IL-2 level and the percentage of $CD4^+CD28^+$ and $CD8^+CD28^+$.[15] The MCF-7 and L929 cell lines were resistant to the proliferative effects of the *Dendrophthoe pentandra* ethyl acetate extract.[16] K562 and MCM-B2 cancer cell lines exhibit cytotoxicity and growth suppression when *Dendrophthoe pentandra* leaf extracts are used *in vitro*.[17] Furthermore, an acute toxicity test of the Indonesian-grown *Dendrophthoe pentandra* n-hexane and ethanolic fraction in male and female mice showed that their LD_{50} of in mice was higher than 2,000 mg/kg body weight without mouse fatality.[18]

The acute and subchronic toxicities study of Indonesian *Dendrophthoe pentandra* revealed that the ethanol extract of *Dendrophthoe pentandra* is safe but using for a long period is not recommended.[19]

A thorough study of the acute toxicity of this plant is necessary to determine the safety of using it as food and medicine. There is no report on the safety and toxicity of leaf extract of *Dendrophthoe pentandra* grown in Thailand. Therefore, the purpose of the current study was to determine the oral acute toxicity of Thai *Dendrophthoe pentandra* leaves in male and female rats in accordance with OECD 420 guidelines.

Materials and Methods

Plant materials

Leaf parts of *Dendrophthoe pentandra* (L.) Miq. (hosted on *Terminalia ivorensis* A. Chev.) were collected from a local cultivation area in Mahasarakham province, Thailand in January 2022. They are authenticated at Department of Biology, Faculty of Science, Mahasarakham University. Voucher specimens (voucher specimen number: MSUT-7714) were deposited in the herbarium of Faculty of Science, Mahasarakham University in Thailand.

Plant extract preparations

The leaves were rinsed with clean tap water in order to remove dirt. They were then cut into small pieces and dried for 48 hr in a hot air oven at 50°C. Using an electrical grinder, the dried leaves of this plant were ground into fine powder. They were macerated in the solvent (95% ethanol) for 7 days with a 1:4 leaf powder to solvent ratio. The ethanol extracts were prepared by adding 1,000 g leaf powder into 4,000 ml 95% ethanol. The crude extracts were filtered using Whatman No.1 filter paper. Using a rotary evaporator, the extracts were then evaporated to remove the solvent. Freeze drying was used to lyophilize the crude extracts. The leaf extracts were stored at 4°C for future *in vivo* research.

Animal model

The OECD 420 guideline was followed in the performance of the acute toxicity research. In this investigation, male and female Wistar rats weighing 150–200 g were employed. They were acquired and kept at the Northeastern Laboratory Animal Center, Khon Khaen University, Khon Kaen, Thailand, which is an Animal Biosafety Level 1 (ABSL1) facility. The animal protocol was approved by the Animal Ethic Committee of Khon Kaen University, Thailand. Number of approval is KKU 7/65.

Experimental design

The Wistar rats with body weight of 150-200 g were divided into ten groups, five male and five female, in accordance with the OECD 420 guidelines for acute toxicity studies. The controls were in Group 1. Normal rats in Group 2 were given 5 mg/kg extracts. Normal rats in Group 3 were given extracts at a dose of 50 mg/kg. Normal rats in Group 4 were given 300 mg/kg extracts. Normal rats in Group 5 were given 2,000 mg/kg extracts.

Once, distilled water and *Dendrophthoe pentandra* leaf extracts were given orally to male and female rats (DPLE). Within 24 hr of doses and for a further 14 days following the studies, the acute toxicity symptoms and fatality rates were noted. The body weights were measured in week 0, 1 and 2. The rats were sacrificed at the end of the experiment by thiopental sodium intraperitoneal injection at dose of 40-60 mg/kg. Following a heart puncture, blood samples were immediately collected for a hematological and biochemical analyses and blood cell morphological investigation.

The hematological values including red blood cell counts and white blood cell counts, blood biochemistry values including AST, ALT, ALP, blood urea nitrogen and creatinine, and lipid profiles including total cholesterol, triglyceride, LDL and HDL were measured using clinical test kits (Randox Laboratories Limited, Antrim, UK).[20]

For the purpose of calculating the relative organ weight, the internal organs, for examples the liver, kidney, heart, lung, and spleen, were removed. They were weighed using a digital balance, and the relative organ weight was computed as follows:

$$\text{Relative organ weight (\%)} = \frac{\text{organ weight (g)}}{\text{body weight (g)}} \times 100$$

Liver and kidney tissues were preserved in 10% neutral formalin for histological analysis. The tissues were promptly fixed in 10 % formalin for 72 hr, with a daily replacement of the fixative, after being thoroughly rinsed with normal saline. The subsequent sequence of alcohols and xylene in the tissue processor machine dried the tissues. Small portions of the dehydrated tissues were cut and put in cassettes. The tissues were sliced with a rotary microtome at a thickness of 5-7 m after being fixed in paraffin. To remove paraffin, the ribbon-like tissues were submerged in a warm water bath. Hematoxylin and eosin were used to stain the tissues after they had been fixed onto a microscope slide. The histology of these tissues was investigated under a light microscope.[21]

Statistical analysis

With the exception of the histology investigation, all parameter values were reported as mean standard error of mean (S.E.M.). One-way ANOVA was used to evaluate mean comparisons. Utilizing SPSS software version 23, statistical analysis was performed with the significance level at $p<0.05$.

Results and Discussion

The results showed that no dose of the extracts caused any deaths or toxic signs in the rats. The behavioral alterations, such as irregular movement, loss of appetite, weight loss, and mortality, were not seen.

The findings showed that no dose of the extracts caused any symptoms of toxicity or mortality in the rats. The relative weight of the organs and overall weight were unaffected by any of the extract doses (Table 1 and 2). Additionally, rats treated with the extracts at doses of 5, 50, 300, and 2,000 mg/kg did not differ statistically from controls in terms of their relative organ weights for the liver, kidney, heart, lung, and spleen (Table 3 and 4).

Dendrophthoe pentandra leaf extracts did not exhibit any harmful effects on hematological markers (Table 5 and 6). The red blood cell (RBC), white blood cell (WBC), platelet, hemoglobin, and hematocrit levels were comparable in the rats given the extracts at doses of 5, 50, 300, and 2,000 mg/kg as well as in the controls. In additions, the extracts did not affect the blood cell morphology (Figure 1 and 2).

In the experimental groups, the lipid profiles, which included total cholesterol, triglycerides, and high-density lipoprotein (HDL) cholesterol, were within the normal range (Table 7 and 8). These findings revealed that the extracts had no impact on the rats' lipid profiles. However, the findings showed that the lipid profiles of the rats in all experimental groups were comparable.

Table 1: Effects of *Dendrophthoe pentandra* leaf extracts on body weight gain in treated and control male rats during the course of the 14-day experiment.

Treatments	Increase body weight (%) (mean ± S.E.M)	
	Week 1	Week 2
Control	20.87 ± 0.84	10.71 ± 1.10
DPLE 5 mg/kg	13.47 ± 3.64	9.00 ± 3.25
DPLE 50 mg/kg	20.49 ± 1.55	9.18 ± 0.58
DPLE 300 mg/kg	16.25 ± 2.39	6.15 ± 0.71
DPLE 2,000 mg/kg	15.17 ± 2.17	7.27 ± 0.48

DPLE = *Dendrophthoe pentandra* leaf extracts

Table 2: Effects of *Dendrophthoe pentandra* leaf extracts on body weight gain in treated and control female rats during the course of the 14-day experiment.

Treatments	Increase body weight (%) (mean ± S.E.M)	
	Week 1	Week 2
Control	7.45 ± 2.19	2.85 ± 0.82
DPLE 5 mg/kg	9.00 ± 1.18	2.74 ± 0.46
DPLE 50 mg/kg	8.91 ± 2.72	3.02 ± 3.49
DPLE 300 mg/kg	5.20 ± 5.25	1.28 ± 1.62
DPLE 2,000 mg/kg	7.75 ± 3.98	3.68 ± 0.51

DPLE = *Dendrophthoe pentandra* leaf extracts

Table 3: Effects of *Dendrophthoe pentandra* leaf extracts on relative organ weight during the 14-day experiment in male rats.

Relative organ weight (%) mean ± S.E.M.	Treatments				
	Control	DPLE 5 mg/kg	DPLE 50 mg/kg	DPLE 300 mg/kg	DPLE 2,000 mg/kg
Liver	3.562 ± 0.550	3.620 ± 0.704	3.531 ± 0.349	3.647 ± 0.376	3.713 ± 0.923
Kidney	0.885 ± 0.102	0.894 ± 0.144	0.886 ± 0.068	0.898 ± 0.143	0.900 ± 0.231
Heart	0.404 ± 0.083	0.331 ± 0.049	0.344 ± 0.027	0.335 ± 0.027	0.334 ± 0.041
Lung	0.252 ± 0.013	0.245 ± 0.040	0.248 ± 0.025	0.233 ± 0.041	0.268 ± 0.063
Spleen	0.503 ± 0.104	0.579 ± 0.075	0.477 ± 0.066	0.488 ± 0.043	0.506 ± 0.094

DPLE = *Dendrophthoe pentandra* leaf extracts

Table 4: Effects of *Dendrophthoe pentandra* leaf extracts on relative organ weight during the 14-day experiment in male rats.

Relative organ weight (%) mean ± S.E.M.	Treatments				
	Control	DPLE 5 mg/kg	DPLE 50 mg/kg	DPLE 300 mg/kg	DPLE 2,000 mg/kg
Liver	3.454 ± 0.138	3.846 ± 0.708	3.648 ± 0.936	3.710 ± 0.277	3.594 ± 0.475
Kidney	0.841 ± 0.025	0.879 ± 0.075	0.878 ± 0.110	0.961 ± 0.072	0.859 ± 0.054
Heart	0.376 ± 0.050	0.379 ± 0.042	0.367 ± 0.040	0.382 ± 0.038	0.370 ± 0.031
Lung	0.248 ± 0.024	0.261 ± 0.039	0.266 ± 0.025	0.269 ± 0.015	0.259 ± 0.025
Spleen	0.585 ± 0.029	0.583 ± 0.061	0.559 ± 0.080	0.586 ± 0.066	0.569 ± 0.066

Table 5: Effects of *Dendrophthoe pentandra* leaf extracts on hematological parameters during the 14-day experiment in male rats, both in the control group and those receiving treatment.

Hematological values mean ± S.E.M.	Treatments				
	Control	DPLE			
		5 mg/kg	50 mg/kg	300 mg/kg	2000 mg/kg
WBC (10^3/µl)	3.64 ± 0.38^{a}	4.94 ± 0.29^{ab}	5.07 ± 0.37^{ab}	5.64 ± 0.58^{bc}	6.81 ± 0.89^{c}
RBC (10^3/µl)	7.23 ± 0.17^{a}	7.78 ± 0.18^{ab}	7.78 ± 0.13^{ab}	8.07 ± 0.19^{ab}	8.19 ± 0.53^{b}
HGB (g/dL)	13.60 ± 0.32^{a}	14.48 ± 0.34^{ab}	14.40 ± 0.15^{ab}	15.24 ± 0.33^{b}	15.66 ± 0.69^{b}
HCT (%)	43.40 ± 1.20^{a}	44.80 ± 1.15^{ab}	45.20 ± 0.86^{ab}	47.40 ± 1.20^{ab}	48.90 ± 2.51^{b}
MCV (fL)	60.36 ± 0.22^{b}	57.66 ± 0.94^{a}	57.82 ± 0.96^{ab}	59.16 ± 0.71^{ab}	58.90 ± 1.00^{ab}
MCH (pg)	19.32 ± 0.03^{a}	18.58 ± 0.19^{a}	18.50 ± 0.23^{a}	18.90 ± 0.21^{a}	19.08 ± 0.47^{a}
MCHC(g/dL)	31.52 ± 0.23^{a}	32.28 ± 0.29^{a}	32.00 ± 0.35^{a}	31.96 ± 0.12^{a}	32.00 ± 0.29^{a}
PLT (10^3/µl)	1056.80 ± 25.34^{ab}	1032.80 ± 4.44^{a}	1194.80 ± 3.55^{bc}	1116.8 ± 21.77^{abc}	1264.00 ± 83.48^{c}
LYMPH (10^3/µl)	84.28 ± 0.55	86.29 ± 1.80^{a}	86.16 ± 1.30^{a}	84.88 ± 1.50^{a}	86.15 ± 1.11^{a}
MONO (10^3/µl)	2.80 ± 0.26^{ab}	1.56 ± 0.70^{a}	3.08 ± 0.46^{ab}	2.90 ± 0.75^{ab}	4.00 ± 0.46^{b}

The blood urea nitrogen (BUN) and creatinine levels in the controls and the rats treated with the extracts at doses of 5, 50, 300, and 2,000 mg/kg were analyzed, along with the liver function parameters serum aspartate aminotransferase (AST), serum alanine aminotransferase (ALT), and alkaline phosphatase (ALP). Rats in all experimental groups had identical blood biochemical values (Tables 9 and 10).

According to the study on the histology of the liver and kidney tissues of rats given leaf extracts from *Dendrophthoe pentandra* at doses of 5, 50, 300, and 2,000 mg/kg, no abnormalities were seen in the rats' liver or kidney tissues.

The histology of the liver in male and female rats given the extracts did not alter. It was discovered that hepatocytes have a single columnar cell and are polygonal in shape (hepatic cord). Simple sinusoid squamous epithelium protected the central vein. Additionally, liver tissue was not affected by the inflammation (Figure 3A-J).

The findings showed that no dose of the extracts caused any signs of toxicity or mortality in the rats. There was no difference in the kidney's histology in rats given the extracts (Figure 3K-T). The parietal epithelium of Bowman's capsule has a square cuboidal shape, while the glomerulus of the kidney cells in mature male rats has a rounded bulbous cup-shaped portion of the nephron (Figure 3K-O). The parietal epithelium of the Bowman's capsule is often flattened in female rats (Figure 3P-T). The results show that all doses of *Dendrophthoe pentandra* extracts had no impact on kidney histopathology, indicating that these plant's extracts are not hazardous to rats' kidneys.

Asian people including Thai people have always used the leaf of *Dendrophthoe pentandra* as traditional medicine and food ingredient. In order to determine the safety of using the leaf of *Dendrophthoe pentandra* as food or medical purposes, the current study examined the acute toxicity of these extracts in male and female rats.

In the current investigation, it was discovered that both male and female rats did not experience or demonstrate acute toxicity at any of the extract doses. Additionally, the extracts had no impact on the histopathology of the liver and kidney, indicating that they were either completely non-toxic or only very mildly toxic in rat models.

These results are consistent with phytochemical screenings that indicated this plant's leaf extracts had significant total phenolic and flavonoid levels, which have antioxidant properties. [2, 3, 6] Additionally, this plant's leaf extracts had supporting pharmacological properties for example, hepatoprotective, antihyperglycemic, and anti-diabetic properties. [7] The leaf extracts from *Dendrophthoe pentandra* also exhibited the hypotensive activity [10] and brain histology [11] and inflammation reduction. [13, 14, 15] Therefore, no harmful materials should be present in the extracts, suggesting that the leaf extracts from *Dendrophthoe pentandra* should be safe for consumption as food ingredients and medicine. However, the chronic toxicity evaluation

should be investigated in order to confirm the long-term safety of this plant.
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Conclusion

These results suggest that *Dendrophthoe pentandra* leaf extracts did not exhibit any acute toxicity signs or symptoms.

Conflict of Interest

The authors declare no conflict of interest.

Authors' Declaration

The authors hereby declare that the work presented in this article is original and that any liability for claims relating to the content of this article will be borne by them.

Acknowledgments

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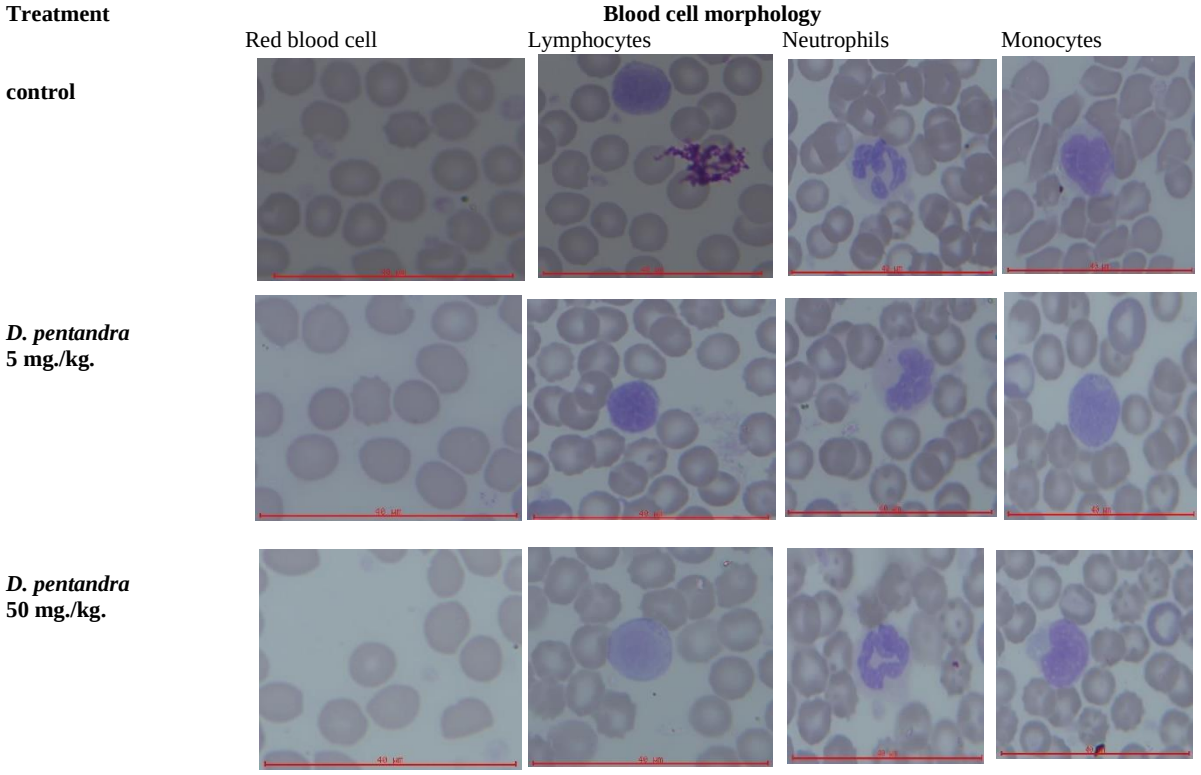
Table 6: Effects of *Dendrophthoe pentandra* leaf extracts on hematological parameters during the 14-day experiment in female rats, both in the control group and those receiving treatment.

Hematological values mean ± S.E.M.	Treatments				
	Control	DPLE			
		5 mg/kg	50 mg/kg	300 mg/kg	2000 mg/kg
WBC (10^3/µl)	5.25 ± 0.62[a]	4.70 ± 0.43[a]	4.95 ± 0.46[a]	5.35 ± 0.25[a]	5.55 ± 0.56[a]
RBC (10^3/µl)	8.03 ± 0.18[a]	8.51 ± 0.32[a]	8.28 ± 0.30[a]	8.34 ± 0.34[a]	8.35 ± 0.33[a]
HGB (g/dL)	14.29 ± 0.29[a]	15.60 ± 0.57[a]	15.30 ± 0.40[a]	15.32 ± 0.55[a]	15.64 ± 0.49[a]
HCT (%)	45.6 ± 1.16[a]	47.40 ± 1.80[a]	46.20 ± 1.71[a]	46.00 ± 1.92[a]	46.40 ± 1.60[a]
MCV (fL)	57.02 ± 0.45[a]	55.84 ± 0.42[a]	55.80 ± 0.34[a]	55.16 ± 1.08[a]	55.76 ± 0.72[a]
MCH (pg)	18.58 ± 0.13[a]	18.32 ± 0.15[a]	18.52 ± 0.23[a]	18.40 ± 0.35[a]	18.76 ± 0.24[a]
MCHC(g/dL)	32.64 ± 0.23[a]	32.80 ± 0.16[ab]	33.18 ± 0.50[ab]	33.38 ± 0.22[ab]	33.66 ± 0.16[b]
PLT (10^3/µl)	1036.60 ± 26.10[a]	1084.60 ± 23.99[a]	1127.00 ± 68.45[a]	1077.40 ± 83.33[a]	996.40 ± 64.46[a]
LYMPH (10^3/µl)	87.98 ± 1.11[ab]	88.64 ± 0.63[ab]	88.94 ± 0.62[ab]	86.46 ± 0.43[a]	90.58 ± 0.73[b]
MONO (10^3/µl)	3.34 ± 0.60[a]	3.16 ± 0.48[a]	3.28 ± 0.60[a]	3.34 ± 0.33[a]	3.10 ± 0.49[a]



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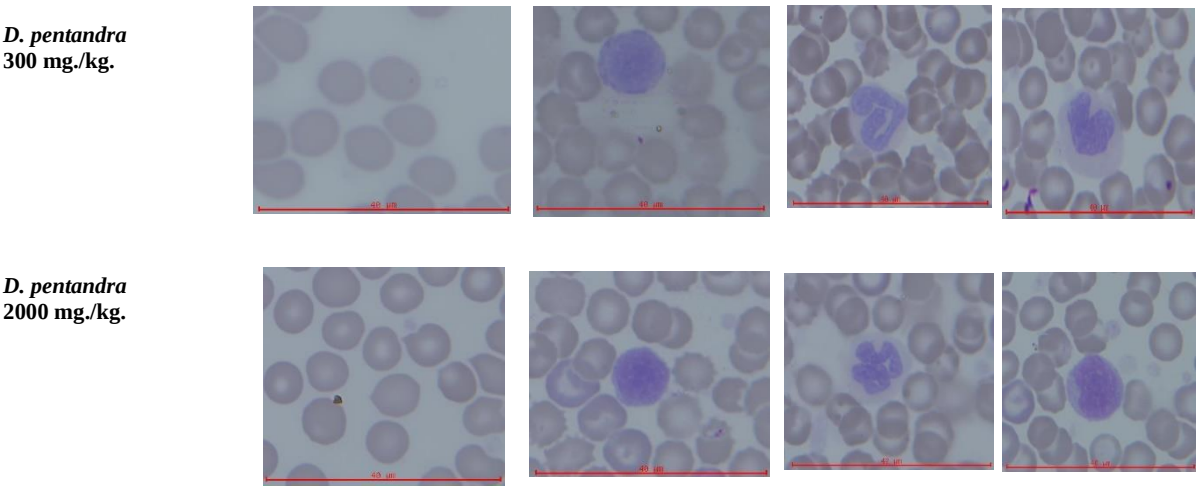
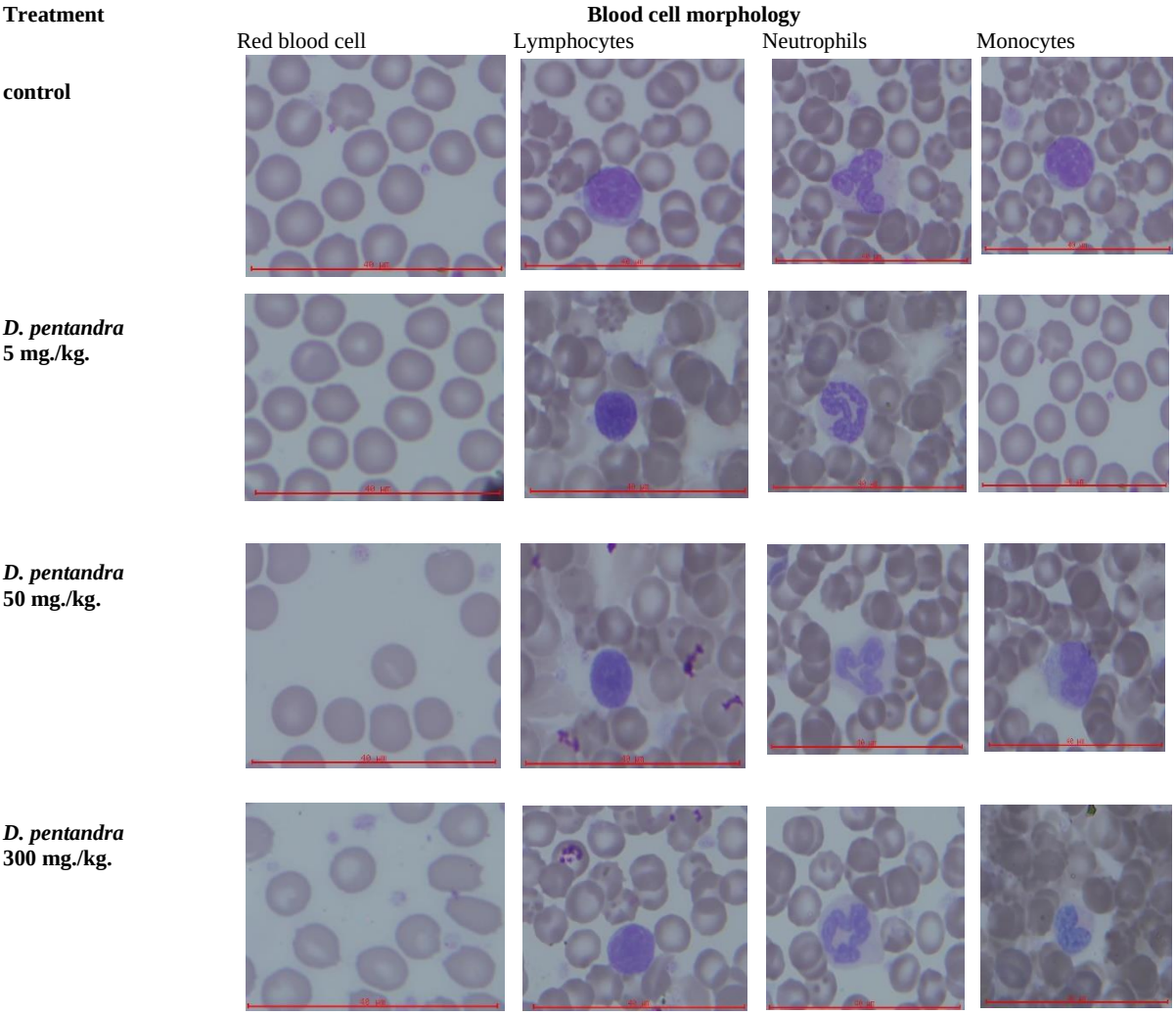


Figure 1: Blood cell morphology of the controls and male rats treated with *Dendrophthoe pentandra* leaf extracts for 14 days (magnification = 100X).



***D. pentandra* 2000 mg./kg.**

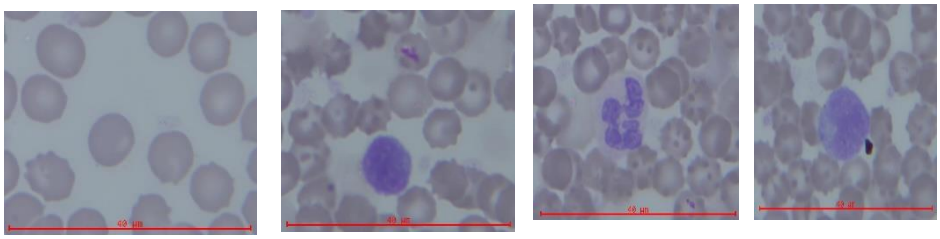


Figure 2: Blood cell morphology of the controls and female rats treated with *Dendrophthoe pentandra* leaf extracts for 14 days (magnification = 100X).

Table 7: Effects of *Dendrophthoe pentandra* leaf extracts on the lipid profiles of control and treated male rats during the course of the 14-day investigation.

Lipid profiles	Treatments				
		DPLE			
	Control	5 mg/kg	50 mg/kg	300 mg/kg	2,000 mg/kg
Cholesterol (mg/dL)	66.6 ± 1.28^{b}	63.2 ± 2.37^{b}	63.8 ± 2.28^{b}	55.8 ± 1.90^{a}	69.2 ± 6.32^{b}
Triglyceride (mg/dL)	44.2 ± 0.20^{b}	58.7 ± 11.5^{a}	43.0 ± 5.48^{a}	54.0 ± 4.63^{a}	49.4 ± 2.13^{ab}
HDL (mg/dL)	43.6 ± 0.50^{bc}	38.8 ± 2.26^{ab}	42.2 ± 1.39^{bc}	35.8 ± 1.62^{a}	44.6 ± 2.71^{c}
LDL (mg/dL)	14.0 ± 1.00^{a}	12.6 ± 2.29^{a}	13.2 ± 1.68^{a}	10.8 ± 0.73^{a}	14.8 ± 1.06^{a}

$^{a, b}$ Different superscripts in the same row indicate statistical significance (P<0.05).

Table 8: Effects of *Dendrophthoe pentandra* leaf extracts on the lipid profiles of control and treated female rats during the course of the 14-day investigation.

Lipid profiles	Treatments				
		DPLE			
	Control	5 mg/kg	50 mg/kg	300 mg/kg	2,000 mg/kg
Cholesterol (mg/dL)	63.0 ± 4.59^{a}	81.0 ± 9.33^{a}	60.2 ± 3.86^{a}	62.4 ± 7.95^{a}	69.0 ± 5.31^{a}
Triglyceride (mg/dL)	27.0 ± 2.09^{b}	40.0 ± 4.62^{ab}	35.8 ± 3.54^{ab}	34.6 ± 5.24^{a}	26.4 ± 3.51^{a}
HDL (mg/dL)	49.8 ± 3.24^{a}	58.9 ± 6.64^{a}	44.0 ± 3.46^{a}	48.2 ± 6.57^{a}	51.8 ± 4.35^{a}
LDL (mg/dL)	8.2 ± 1.24^{a}	13.0 ± 2.52^{b}	8.6 ± 1.20^{ab}	7.4 ± 1.43^{a}	12.2 ± 0.91^{ab}

$^{a, b, c}$ Different superscripts in the same row indicate statistical significance (P<0.05).

Table 9: Effects of *Dendrophthoe pentandra* leaf extracts on blood chemistry measurements in control and administered male rats over the course of the 14-day investigation.

Blood chemistry values	Treatments				
		DPLE			
	Control	5 mg/kg	50 mg/kg	300 mg/kg	2,000 mg/kg
BUN (mg/dL)	16.60 ± 0.68^{ab}	18.40 ± 0.51^{b}	15.20 ± 0.73^{a}	15.80 ± 1.02^{a}	14.60 ± 0.93^{a}
CREA (mg/dL)	0.26 ± 0.02^{a}	0.30 ± 0.00^{a}	0.28 ± 0.02^{a}	0.26 ± 0.02^{a}	0.28 ± 0.02^{a}
AST (U/L)	128.00 ± 7.09^{a}	126.60 ± 6.76^{a}	131.00 ± 11.89^{a}	134.00 ± 16.59^{a}	133.00 ± 16.83^{a}
ALT (U/L)	33.20 ± 1.24^{b}	39.20 ± 2.48^{a}	33.80 ± 1.28^{ab}	34.00 ± 2.49^{ab}	34.20 ± 1.16^{ab}
ALP (U/L)	137.20 ± 9.40^{a}	110.60 ± 8.30^{bc}	110.20 ± 6.57^{bc}	103.00 ± 3.21^{c}	129.20 ± 4.33^{ab}

$^{a, b, c}$ Different superscripts in the same row indicate statistical significance (P<0.05).

Table 10: Effects of *Dendrophthoe pentandra* leaf extracts on blood chemistry measurements in control and administered female rats over the course of the 14-day investigation.

Blood chemistry values	Treatments				
	Control	DPLE			
		5 mg/kg	50 mg/kg	300 mg/kg	2,000 mg/kg
BUN (mg/dL)	16.60 ± 0.81^{a}	17.60 ± 0.60^{a}	15.40 ± 1.36^{a}	15.60 ± 0.24^{a}	17.20 ± 0.86^{a}
CREA (mg/dL)	0.30 ± 0.00^{b}	0.30 ± 0.00^{b}	0.26 ± 0.02^{ab}	0.24 ± 0.02^{a}	0.30 ± 0.00^{b}
AST (U/L)	118.60 ± 10.22^{a}	125.00 ± 14.58^{a}	128.20 ± 5.08^{a}	127.60 ± 11.94^{a}	127.20 ± 10.59^{a}
ALT (U/L)	32.20 ± 2.08^{a}	30.40 ± 1.81^{a}	28.40 ± 2.84^{a}	28.00 ± 2.88^{a}	30.20 ± 2.80^{a}
ALP (U/L)	57.00 ± 4.82^{a}	59.60 ± 3.41^{a}	68.80 ± 5.89^{a}	59.40 ± 5.31^{a}	64.60 ± 2.86^{a}

$^{a, b, c}$ Different superscripts in the same row indicate statistical significance (P<0.05).

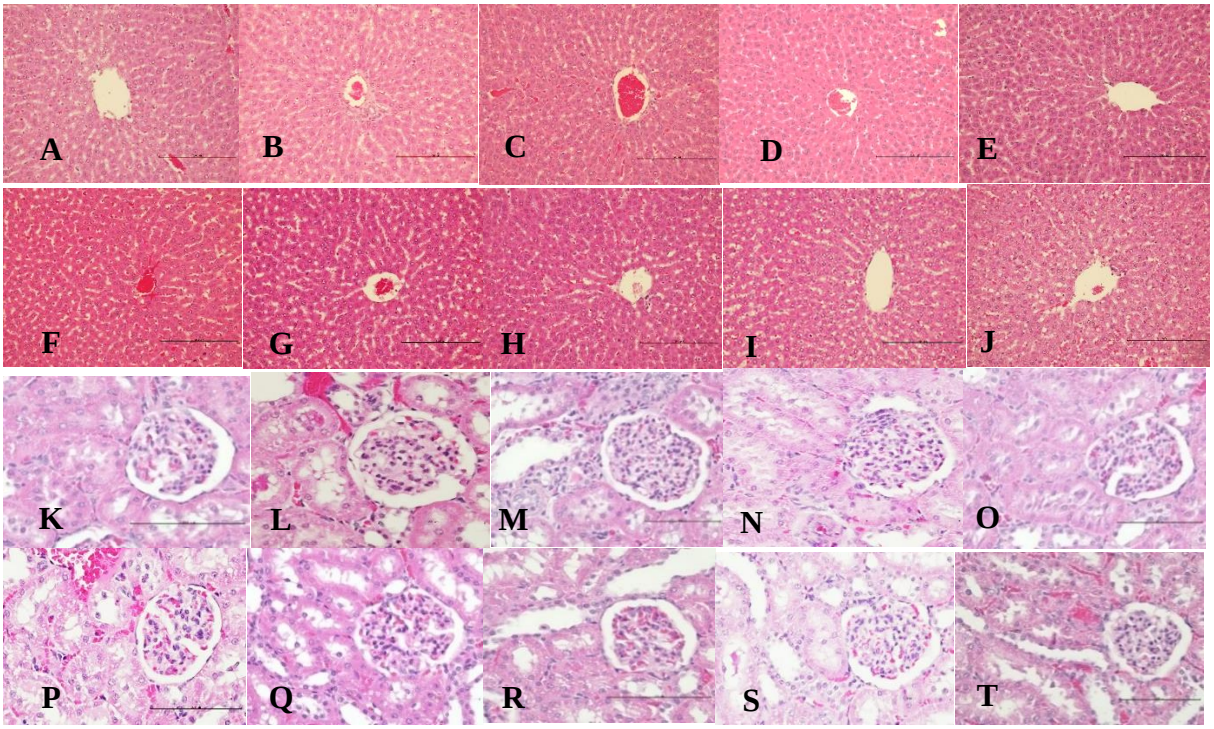


Figure 3: Histopathological illustration of liver and kidney in male and female rats treated with *Dendrophthoe pentandra* leaf extracts for 14 days (magnification = 40X); A=control male liver; B=male liver with 5 mg/kg extract; C=male liver with 50 mg/kg extract; D=male liver with 300 mg/kg extract; E=male liver with 2,000 mg/kg extract; F=control female liver; G=female liver with 5 mg/kg extract; H=female liver with 50 mg/kg extract; I=female liver with 300 mg/kg extract; J=female liver with 2,000 mg/kg extract; K=control male kidney; L=male kidney with 5 mg/kg extract; M=male kidney with 50 mg/kg extract; N=male kidney with 300 mg/kg extract; O=male kidney with 2,000 mg/kg extract; P=control female kidney; Q=female kidney with 5 mg/kg extract; R=female kidney with 50 mg/kg extract; S=female kidney with 300 mg/kg extract; T=female kidney with 2,000 mg/kg extract

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