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Polyphenolic Content, Antioxidant Activity and Acute Toxicity of *Gouania longispicata* Engl. Leaves

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Abstract: *Gouania longispicata* Engl. (*G. longispicata*) is one of the understudied medicinal lianas used in Africa for treating more than 40 ailments, including oxidative stress-induced conditions. We herein report for the first time on the total polyphenolic content, antioxidant potential, and acute toxicity of *G. longispicata* aqueous and methanolic leaf extracts. The extracts were assessed for their total phenolic content (TPC) and total flavonoid content (TFC) using the Folin-Ciocalteu method and aluminum chloride colorimetric assay, respectively. The antioxidant potential of the extracts was quantified using the DPPH, ferric-reducing antioxidant power, and hydrogen peroxide scavenging assays, while the acute toxicity test followed the Lorke method. The highest TPC (75.26±0.420 GAE μg/g DW) and TFC (60.12±0.012 QE μg/g DW) were for the methanolic extract ($P<0.05$). Antioxidant activity was highest for the aqueous extract, with a minimum inhibitory concentration of 187.12±0.08 μg/mL. Our results showed that all the extracts' median lethal dose was higher than 5000 mg/kg, suggesting that they were not potentially toxic. We recommend further studies should perform phytochemical studies on the leaf extracts of this species to identify the responsible bioactive compounds.

Keywords: *Gouania longispicata*; acute toxicity; total phenolic content; oxidative stress.

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1. Introduction

Oxidative stress has a role in the etiology of non-communicable diseases such as Alzheimer's disease, skeletal muscle atrophy, cancer, diabetes, atherosclerosis, and chronic obstructive pulmonary disease. These conditions continue to pose a major danger to global health.[1, 2]. The figures that are now available indicate that circumstances mediated by oxidative stress have resulted in a rise in mortality and morbidity. Recent Global cancer statistics indicate a rise in the disease burden. For example, in the USA, cancer has spiraled in recent decades, and about 1,900,000 new cases and 609,820 deaths were projected to occur in 2023 alone [3]. Oxidative stress is usually managed using commercially available antioxidants such as vitamins E and C, flavonoids, tannins, and polyphenols [4]. Medicinal plants are a significant source of antioxidants because they donate electrons to the intermediate radicals [5]. This could explain the traditional reliance of indigenous communities on using medicinal plants for managing oxidative stress-induced conditions [2, 6, 7].

A diversified ecological and cultural setup characterizes Africa and East Africa, so using different plant species to manage several conditions, including oxidative stress, is highly suspected [8]. In our recent ethnobotanical surveys [9, 10], *Gouania longispicata* Engl. (locally known as *Omufurura* in Rukiga dialect) was identified as one of the most used medicinal plants in Western Uganda. It is used to treat up to 41 diseases, including stomachache, syphilis, toothache, allergy, and urinary retention. The local communities emphasized that this species can be used to treat nearly all diseases [10].

Gouania longispicata Engl. (*G. longispicata* henceforth) is a scandent liana in the family *Rhamnaceae* with greyish leaves and greenish-yellow flowers. Its heterotypic synonym is *Gouania* seretii De Wild. and the epithet in the species name ‘‘*longispicata*’’ alludes to its possession of ‘‘a long spike’’ [11]. The species is widely distributed in tropical countries, including Kenya, Ethiopia, Benin, Nigeria, Uganda, Burundi, Congo, Sudan, Tanzania, Mozambique, Rwanda, Cameroon, Zimbabwe, and Malawi [11-15].

Previous reports from Uganda, Rwanda, Cameroon, and Ethiopia have cited the use of sap, stems, stem exudate, roots, and leaves of G. longispicata in traditional treatment of fetal troubles, lung and skin cancer, oral thrush, stomachache and increasing strength in children [16-20]. The leaves and bark of this species are also eaten by Mountain gorillas (*Gorilla beringei beringei*) in Bwindi Impenetrable National Park, Uganda [21] and Grauer’s Gorillas (*Gorilla beringei graueri*) in the Montane Forest of the Democratic Republic of Congo [22]. Due to the paucity of published literature on the efficacy of *G. longispicata* in the claimed treatment of ailments in Uganda, we recently investigated its leaf extracts’ antifungal and antibacterial potential [23]. Since then, the antibacterial potential of this species has been reconfirmed by other research groups from Cameroon [13] and Rwanda [24]. In our continued effort to verify the traditional claim of using *G. longispicata* against oxidative stress-mediated conditions in Uganda, we herein report its leaf extracts' antioxidant potential and acute toxicity for the first time. The total phenolic and flavonoid contents were also quantified to determine whether they contribute to the antioxidant effect of this species.

2. Materials and Methods

2.1. Ethical considerations.

This study was approved by the Mbarara University of Science and Technology Research Ethics Committee (MUST-REC; protocol no. 19/08-17) and Uganda National Council for Science and Technology (No. NS34ES).

2.2. Plant material collection and extraction procedure.

Fresh *G. longispicata* leaves were harvested in June 2018 from Rukungiri District, Uganda (latitude: -0.584175, longitude: 29.795473). The plant was identified and authenticated at the Department of Biology, Mbarara University of Science and Technology (MUST), Uganda, where a voucher specimen (GH18-02) was kept.

The leaves were washed with distilled water and then air-dried for 1 week. They were ground into powder employing an electric grinder. Hot maceration was used to obtain the aqueous extract to mimic the claimed traditional usage of this plant. Briefly, 200 g of the powder was soaked in 1 L of hot distilled water for 4 hours. The mixture was filtered to obtain the extract (TAQE). Methanolic extract (MEE) was obtained using a Soxhlet extractor with 200 g of leaf powder and methanol. The residue from Soxhlet extraction was dried and

subjected to maceration using hot distilled water to obtain the aqueous extract (AQE). The MEE extract was concentrated through rotary evaporation under low pressure while TAQE and AQE were freeze-dried.

2.3. Total polyphenolic content of the extracts.

The leaf extracts' total phenolic content (TPC) was quantified using the Folin-Ciocalteu method [6] with some modifications. Briefly, gallic acid solutions prepared in methanol (1.953, 3.906, 7.813, 15.625, and 31.250 µg/mL) were used for preparing calibration curves. The experimental extract concentrations were 31.25, 62.5, 125, 250, 500, and 1000 µg/mL. The TPC of the extracts was expressed as gallic acid equivalents per microgram of dry weight (GAE µg/g DW), as described previously [6].

On the other hand, the total flavonoid content (TFC) of the extracts was established using the aluminum chloride colorimetric assay using quercetin solutions in methanol (1.953, 3.906, 7.813, 15.625, 31.25, 62.5, 125 and 250 µg/mL) as a standard [6]. The absorbances of the extracts mixed with aluminum chloride as well as quercetin standard solutions were measured at 415 nm using a UV-vis spectrophotometer [25]. Results were expressed in quercetin equivalents per gram of plant extract dry weight (QE µg/g DW).

2.4. Assessment of the antioxidant potential of the extracts.

2.4.1. Free radical scavenging activity of the extracts.

The antioxidant potential of the extracts was assessed using the 2,2-diphenyl-1-picrylhydrazyl (DPPH) free radical following the method described by Brand-Williams et al. [26] with some modifications [6]. Different concentrations (1.953, 3.906, 7.813, 15.625, 31.25, 62.5, 125, 250, and 500 µg/mL) of methanolic solutions were used for the assay [6]. The absorbance of the mixtures was measured at 517 nm against the blank solution consisting of 2.5 mL methanol and 0.5 mL distilled water. The radical scavenging activity was expressed as the radical scavenging percentage from which the minimum inhibitory concentration (IC_{50}) was calculated as described before [27].

2.4.2. Ferric reducing antioxidant power of the extracts.

The extracts' reducing power was quantified using the ferric reducing antioxidant power (FRAP) assay [28] with slight modifications. Measured 0.75 mL of the plant extracts (1.953, 3.906, 7.813, 15.625, 31.25, 62.5, 125, 250, 500, and 1000 µg/mL) were mixed with 0.75 mL of phosphate buffer (0.2 M, pH = 6.6) and 0.75 mL of potassium ferricyanide (1%, w/v). The mixture was incubated at 50°C for 20 minutes. The reaction was stopped by adding 0.75 mL of trichloroacetic acid (10%) and centrifuging at 3000 rpm for 10 minutes. The supernatant (1.5 mL) was mixed with 1.5 mL of distilled water and 0.1 mL of freshly prepared 0.1% ferric chloride solution. The absorbance was recorded at 700 nm with a double beam Jenway 6705 UV/Visible Scanning Spectrophotometer (Thermo Fisher Scientific, USA). Ascorbic acid (a known antioxidant) was used as a standard.

2.4.3. Hydrogen peroxide scavenging capacity of the extracts.

This was done by replacement titration, according to Ambarish and Sridhar [29]. An aliquot of 1.0 mL of 0.1 mM hydrogen peroxide and 1 mL of the extracts (various

concentrations), followed by 2 drops of 3% ammonium molybdate, 10 mL of 2M sulphuric acid, and 7 mL of 1.8M potassium iodide. The mixture was titrated against 5.09 mM sodium thiosulphate until the disappearance of the yellow color. The scavenging activity was obtained using Equation 1.

$$\text{Scavenging activity }(\%) = \frac{V_{control} - V_{sample}}{V_{control}} \times 100 \qquad (1)$$

Wherein $V_{control}$ = volume of sodium thiosulphate solution used without the extract, V_{sample} = volume of sodium thiosulphate solution used in the presence of the extract.

2.5. Acute toxicity of the extracts.

Male Wistar rats (130-160 g) were obtained from the animal house, Department of Pharmacology, Kampala International University, Uganda. The animals were provided with a standard diet and water *ad libitum*. The rats were acclimatized for 2 weeks before commencement of the experiment. The handling of experimental rats followed the standard guide for the care and use of laboratory animals [30].

The extracts were administrated orally in two phases following Lorke's method [31]. Initially, three groups of 3 rats were administered 10, 100, and 1000 mg/kg of the extracts suspended in normal saline. The control group received only normal saline. The second phase involved three groups, with 1 rat per group receiving 1600, 2900, and 5000 mg/kg of the extracts. For 14 days, toxicity signs were noted across all the groups. The median lethal dose (LD_{50}) was calculated.

2.6. Hematological analysis.

After another 14 days (at 28 days), all the animals were anesthetized by chloroform inhalation, and blood samples were collected by cardiac puncture. Cardiac puncture followed standard operating procedures according to Beeton et al. [32] and the American Association of Laboratory Animal Science [33]. The animal was placed in dorsal recumbency once it had reached an appropriate plane of anesthesia. The skin and abdominal wall were carefully cut open. The internal organs were then moved aside to expose the heart. A needle (23G1) with a syringe was carefully inserted into the right ventricle of the heart, and the plunger retracted to aspirate blood. The blood (7 mL) was collected into bottles with EDTA. Hematological parameters were evaluated using a hematological auto-analyzer (Mindray BC-2800 Auto Hematological Analyzer, England).

2.7. Statistical analysis of data.

Quantitative data were averaged and thereafter subjected to data normality assessment using the Shapiro-Wilk test. One-way analysis of variance (ANOVA) followed by Tukey's posthoc test was further performed at a 95% confidence interval. Data analyses and visualization proceeded in Microsoft Excel and GraphPad Prism (version 9, GraphPad Software, USA).

3. Results and Discussion

3.1. Total polyphenolic content of the extracts.

Three extracts (TAQE, MEE, and AQE) were tested in this study. Specifically, TAQE was used to mimic the claimed traditional usage of this plant, where hot water maceration is used to obtain the aqueous extract [10]. Soxhlet extraction using methanol and then maceration in hot water follows from our previous study verifying the antimicrobial activity of this species [23]. The TPC and TFC of the extracts were determined from standard curves and exhibited significant differences (P<0.05) among the extracts (Table 1). The higher TPC values than those of TFC observed are expected since the latter is usually a component of TPC [6, 34]. The methanolic extract's relatively higher TPC and TFC are explained by it being a polar protic solvent. As such, it can extract more phenolics by forming hydrogen bonds [35, 36]. These results strongly suggest that most phenolic compounds in *G. longispicata* leaf extracts contain polar groups. Moreover, differences in the polarities of solvents used in extraction can influence their TPC and TFC profiles. For example, water, a known universal solvent, is reported to extract even non-bioactive compounds (such as proteins and sugars) in plant leaves that do not usually contribute to plant extracts' TPC, TFC, and some bioactivities [6, 37].

In previous studies in the same genus, petroleum ether soluble fraction and methanolic extract of *Goiania tiliifolia* whole plant had the highest TPC of 78.30±1.60 mg GAE and 70.37 mg GAE [38], which are higher than those found for *G. longispicata* leaf extracts in this study. Soh et al. [39] also found higher TPC (0.375 and 0.299 mg GAE/g DW) and TFC (11.615 and 10.012 µg QE/g DW) for *Gouania longipetala* leaves and stem than those reported in this study.

Table 1. Total phenolic content and flavonoid content of *G. longispicata* leaf extracts.

Total polyphenolic content	Methanolic extract[1]	Aqueous extract	Traditionally prepared aqueous extract
Total phenolic content (GAE µg/g DW)	75.26±0.420^{a}	61.38±0.071^{b}	46.21±0.035^{d}
Total flavonoid content(QE µg/g DW)	60.12±0.012^{b}	26.10±0.089^{c}	31.64±0.028^{e}

[1] Means with different superscript letters are statistically different as per one-way ANOVA (P<0.05).

3.2. Antioxidant activity of the leaf extracts.

The methanolic, aqueous, and traditionally prepared aqueous extracts were able to scavenge DPPH radicals. From the in vitro antioxidant assay results (Table 2), the mimicked-aqueous extract (TAQE) had the least IC_{50} value, which was, however, slightly higher than that of ascorbic acid (P<0.05), indicating that it had inferior radical scavenging activity when compared to ascorbic acid. The ferric-reducing power assay of *G. longispicata* leaf extracts indicated they elicited concentration-dependent reducing power (Figure 1).

Table 2. Minimum inhibitory concentration of *G. longispicata* leaf extracts.

Extract/control	IC_{50} value (µg/mL) [1]
Methanolic extract	252.84±0.12 ^{a}
Aqueous extract	187.12±0.08 ^{b}
Traditionally prepared aqueous extract	191.53±0.09 ^{b}
Ascorbic acid (positive control)	158.24±0.11 ^{c}

[1] Values are means ± standard deviations of triplicates. Means with different superscript letters indicate statistical difference at P<0.05.

Higher absorbances indicated that the extracts had a stronger reducing power, but ascorbic acid (a known antioxidant) had a higher reducing power than all the extracts. The reducing ability of plant extracts may be related to their inherent possession of reductants that can break the free radical chain by donating a hydrogen atom or preventing peroxide formation [25].

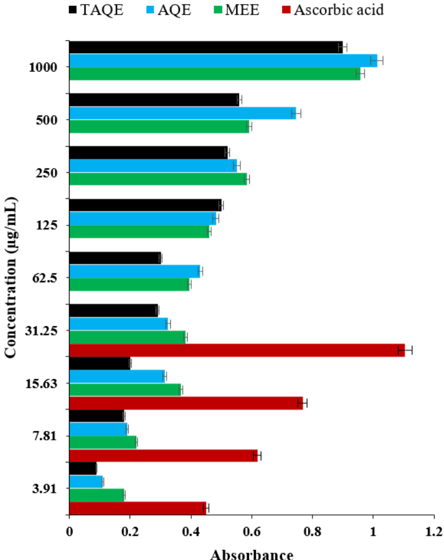

Figure 1. Ferric reducing power of *G. longispicata* leaf extracts. TAQE = traditionally prepared aqueous extract, MEE = methanolic extract, and AQE = aqueous extract. Values are means of triplicates.

On the other hand, the extracts exerted a concentration-dependent hydrogen peroxide scavenging activity. The extracts showed lower percentage inhibition than the ascorbic acid standard at all concentrations (Figure 2), indicating that their activity was inferior to the standard's. This study's results agree with those of Soh et al. [39], where *G. longipetala* extracts elicited antioxidant effects by inhibiting peroxidation and reducing ferric ions. Another report indicated that the TPC of *G. longipetala* stem extract (52.02 mg/g tannic acid equivalent) correlated highly with its total antioxidant capacity [40].

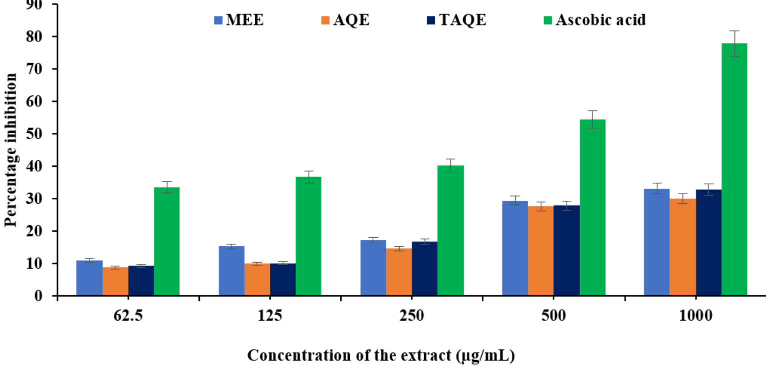

Figure 2. Peroxide scavenging potential of *G. longispicata* leaf extracts. TAQE = traditionally prepared aqueous extract, MEE = methanolic extract, and AQE = aqueous extract. Values are means of triplicates.

3.3. Acute toxicity tests of G. longispicata leaf extracts.

Oral administration of the active leaf extracts of *G. longispicata* to rats did not cause lethality. The LD_{50} of the leaf crude extracts was above the limit dose of 5,000 mg/kg. The animals exhibited normal activity during the two weeks post-administration observation for delayed toxic effects. In both phases, there was mild diarrhea within all the animal groups, which cleared within the first three hours after administration of the extracts. This could have

been due to the effects of the solvents used in preparing the extract. Other signs of toxicity, such as tremors, salivation, and lethargy, were not observed. In a similar study, no death or signs of toxicity were observed in the rats treated with different doses (100-4000 mg/kg) of *G. longipetala* for 48 hours [41]. Another report by the same authors indicated that *G. longipetala* extracts have LD_{50} >4000 mg/kg [42], concordant with our observations.

3.4. Effects of G. longispicata leaf extracts on hematological parameters.

The effects of delayed acute administration of TAQE, MEE, and AQE of G. longispicata on hematological parameters are presented in Tables 3, 4, and 5, respectively. The results showed no significant ($P > 0.05$) variations in the hematological indices compared to the negative control. These results are in agreement with the hematological parameters of *G. longipetala* extracts (a species from the genus Gouania), which did not show any significant differences in hematological parameters from the control [41]. In a related study, hematological parameters of *Marsdenia tenacissima* leaves, like hemoglobin, total RBCs, RDW, WBCs, neutrophils, lymphocytes, monocytes, and platelet count in treated rats, were also not significantly different from those of the control [43]. These studies led to the conclusion that *G. longipetala* and *Marsdenia tenacissima* were well tolerated in short-term therapies. The acute toxicity results of the current study show that *G. longispicata* is safe in short-term therapies.

Table 3. Effects of *G. longispicata* traditionally prepared aqueous extract (TAQE) on hematological parameters in the acute toxicity study.

Parameter	Unit	Control	10 mg/kg	100 mg/kg	1000 mg/kg
WBC	10^9/L	8.68±0.940	8.67±0.663	8.376±0.005	8.51±0.425
LYM	10^9/L	5.9±1.032	5.56±0.242	5.646±0.139	5.73±1.690
MON	10^9/L	1.5±0.145	1.6±0.304	1.713±0.717	1.08±0.721
GRA	10^9/L	1.29±0.834	1.5±0.342	1.016±0.333	1.70±0.025
LYM	%	68.9±0.374	69.66±1.465	67.1±2.402	67.06±0.232
MON	%	16.65±1.384	16.13±0.351	16.33±4.178	16.06±1.814
GRA	%	14.4±0.061	13.23±1.098	14.53±2.709	15.9±0.413
RBC	10^{12}/L	7.09±0.425	7.07±0.936	6.976±0.226	7.23±1.488
HGB	g/dL	13.55±0.747	13.6±2.645	12.93±2.119	13.766±2.20
HCT	%	39.73±0.316	37.96±0.346	35.7±0.552	37.6±0.160
MCV	fL	55.0±1.656	53.0±0.5	51.66±5.033	52.33±1.527
MCH	Pg	20.0±1.838	19.1±1.311	18.6±1.249	19.13±0.907
MCHC	g/dL	36.5±0.071	36.0±1.153	36.03±1.594	36.76±1.331
RDWs	fL	24.2±0.707	22.23±0.497	25.23±0.332	20.4±1.749
RDWc	%	15.65±1.767	16.53±0.862	17.66±0.201	16.03±1.401
PLT	10^9/L	457.5±0.466	445.33±0.153	458.66±0.736	419.0±0.992
PCT	%	0.32±0.141	0.29±0.08	0.353±0.075	0.28±0.232
MPV	fL	6.55±0.636	6.9±0.529	6.6±0.608	6.4±0.030
PDWs	fL	7.99±0.141	7.76±1.484	7.86±1.154	7.83±1.285
PDWc	%	33.95±0.212	33.9±2.488	33.93±1.270	33.83±1.497
P-LCC	10^9/L	80.0±0.0416	79.67±1.026	80.33±0.403	79.4±0.507
P-LCR	%	15.84±0.498	15.73±1.249	15.103±0.540	15.95±1.954

Note: WBC = White blood cells, LYM = Lymphocyte, MON = monocyte count, GRA = Glucocorticoid-remediable aldosteronism, RBC = Red blood cell, HGB = Hemoglobin, HCT = Hematocrit, MCV = Mean corpuscular volume, MCH = Mean corpuscular hemoglobin, MCHC = mean corpuscular hemoglobin concentration; RDWs = Red Cell Distribution Width, PLT = Platelet Count, PCT = Patent Cooperation Treaty, MPV = Mean platelet volume, PDWs/PDWc = Platelet Distribution Width; P-LCC = Platelet large cell count, P-LCR = Platelet-large cell ratio.

Table 4. Effect of *G. longispicata* methanolic extract (MEE) on hematological parameters in the acute toxicity study.

Parameter	Unit	Control	10 mg/kg	100 mg/kg	1000 mg/kg
WBC	10^9/L	8.68±0.940	8.35±0.941	8.16±0.544	8.53±0.016

Parameter	Unit	Control	10 mg/kg	100 mg/kg	1000 mg/kg
LYM	10^9/L	5.9±1.032	5.34±0.536	5.57±1.715	5.18±0.468
MON	10^9/L	1.5±0.145	1.93±0.461	1.18±0.450	1.01±0.643
GRA	10^9/L	1.29±0.834	1.07±0.140	1.40±0.768	1.34±0.350
LYM	%	68.9±0.374	68.6±0.600	64.06±0.130	68.6±0.08
MON	%	16.65±1.384	16.4±0.450	16.8±0.978	16.4±1.334
GRA	%	14.4±0.061	14.0±1.808	14.1±0.229	14.9±1.250
RBC	10^{12}/L	7.09±0.425	6.79±0.786	7.08±0.461	7.12±0.600
HGB	g/dL	13.55±0.747	12.86±0.945	13.26±0.776	13.9±1.193
HCT	%	39.73±0.316	35.73±2.263	37.10±0.650	39.4±3.013
MCV	fL	55.0±1.656	53.33±0.041	52.33±0.214	55.3±0.511
MCH	pg	20.0±1.838	19.1±1.113	18.73±0.585	19.6±1.305
MCHC	g/dL	36.5±0.071	36.1±0.655	35.76±0.209	35.4±0.208
RDWs	fL	24.2±0.707	29.2±0.991	25.53±0.293	25.8±0.497
RDWc	%	15.65±1.767	19.1±0.686	18.06±0.193	17.2±0.602
PLT	10^9/L	457.5±0.466	498.33±0.631	465.33±0.279	475.33+0.951
PCT	%	0.32±0.141	0.31±0.077	0.35±0.157	0.37±0.078
MPV	fL	6.55±0.636	6.36±0.404	6.83±0.251	6.43±0.230
PDWs	fL	7.99±0.141	8.13±0.965	8.26±0.850	7.93±0.850
PDWc	%	33.95±0.212	34.06±0.375	34.0±0.113	33.86±0.83
P-LCC	10^9/L	80.0±0.0416	80.33±0.846	80.0±0.073	79.34±1.385
P-LCR	%	15.84±0.498	15.67±0.319	16.08±0.906	15.32±0.030

Note: WBC = White blood cells, LYM = Lymphocyte, MON = monocyte count, GRA = Glucocorticoid-remediable aldosteronism, RBC = Red blood cell, HGB = Hemoglobin, HCT = Hematocrit, MCV = Mean corpuscular volume, MCH = Mean corpuscular hemoglobin, MCHC = mean corpuscular hemoglobin concentration; RDWs = Red Cell Distribution Width, PLT = Platelet Count, PCT = Patent Cooperation Treaty, MPV = Mean platelet volume, PDWs/PDWc = Platelet Distribution Width; P-LCC = Platelet large cell count, P-LCR = Platelet-large cell ratio.

Table 5. Effect of *G. longispicata* aqueous extract (AQE) on hematological parameters in acute toxicity studies.

Parameter	Unit	Control	10 mg/kg	100 mg/kg	1000 mg/kg
WBC	10^9/L	8.68±0.940	7.78±1.041	8.31±0.765	9.84±4.094
LYM	10^9/L	5.9±1.032	5.16±0.937	5.21±1.619	5.46±3.588
MON	10^9/L	1.5±0.145	1.46±0.507	1.39±0.230	1.14±0.333
GRA	10^9/L	1.29±0.834	1.15±0.874	1.70±0.842	1.24±0.690
LYM	%	68.9±0.374	66.5±2.808	62.0±1.43	64.9±1.989
MON	%	16.65±1.384	16.4±0.006	16.0±0.484	16.1±1.873
GRA	%	14.4±0.061	14.9±11.13	14.9±1.79	13.9±0.219
RBC	10^{12}/L	7.09±0.425	7.63±0.362	7.06±0.876	7.29±0.441
HGB	g/dL	13.55±0.747	13.9±0.916	13.1±1.950	13.53±0.404
HCT	%	39.73±0.316	41.7±2.905	39.0±0.850	39.76±1.805
MCV	fL	55.0±1.656	54.6±0.516	56.33±1.527	54.0±1.732
MCH	pg	20.0±1.838	19.5±0.360	20.4±0.404	19.83±0.611
MCHC	g/dL	36.5±0.071	35.7±1.228	35.0±0.270	36.53±1.361
RDWs	fL	24.2±0.707	21.6±1.893	28.0±0.600	25.26±0.950
RDWc	%	15.65±1.767	15.6±0.814	17.6±0.116	17.26±0.550
PLT	10^9/L	457.5±0.466	499.33±0.312	478±0.864	462.33±0.990
PCT	%	0.32±0.141	0.31±0.017	0.38±0.04	0.31±0.025
MPV	fL	6.55±0.636	6.23±0.152	6.53±0.115	6.83±1.305
PDWs	fL	7.99±0.141	7.93±0.351	7.3±0.2	8.33±0.746
PDWc	%	33.95±0.212	33.99±0.611	33.89±0.351	34.03±0.296
P-LCC	10^9/L	80.0±0.0416	79.66±8.326	80.3±1.933	79.66±0.003
P-LCR	%	15.84±0.498	15.5±1.506	15.37±1.861	15.52±0.050

Note: WBC = White blood cells, LYM = Lymphocyte, MON = monocyte count, GRA = Glucocorticoid-remediable aldosteronism, RBC = Red blood cell, HGB = Hemoglobin, HCT = Hematocrit, MCV = Mean corpuscular volume, MCH = Mean corpuscular hemoglobin, MCHC = mean corpuscular hemoglobin concentration; RDWs = Red Cell Distribution Width, PLT = Platelet Count, PCT = Patent Cooperation Treaty, MPV = Mean platelet volume, PDWs/PDWc = Platelet Distribution Width; P-LCC = Platelet large cell count, P-LCR = Platelet-large cell ratio.

4. Conclusions

This study showed that G. longispicata leaf extracts were not toxic and had therapeutic phytochemicals with antioxidant potential. The methanolic extract had the highest polyphenolic content, while antioxidant activity was highest for the aqueous extract. This supports the ethnomedicinal utilization of G. longispicata leaves in treating oxidative stress-mediated ailments in Uganda. However, further phytochemical studies are required to isolate and characterize the responsible bioactive compounds.

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Conflicts of Interest

The authors declare no conflict of interest.

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