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Anxiolytic Effects, Antioxidant and Anti-inflammatory Activities of the Methanol Extract of *Jatropha tanjorensis* Leaf

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Abstract

The methanol leaf extract of *Jatropha tanjorensis* was analyzed for its bioactive components, *in-vitro* antioxidant, antidepressant, anxiolytic and anti-inflammatory activities using established methods. The phytochemicals detected were saponins, tannins, terpenoids, phenolic compounds, alkaloids, flavonoids and eugenols. The total phenolic content (TPC) was 36.48 mgGAE/g, while the total flavonoid content (TFC) was 145.92 mgQE/g of the extract. 1, 1-diphenyl-2-picrylhydrazyl radical scavenging activity gave an IC_{50} of 185.02 and 5.15 µg/mL for the extract and ascorbic acid (standard), respectively. The 50% lethal dose (LD_{50}) was greater than 5000 mg/kg, while graded doses of 50, 100 and 200 mg/kg of the plant extract relieved depression in mice to 93.3, 100 and 80.8%, respectively when compared with 10 mg/kg amitriptyline (positive control). A significant anxiety reduction, exemplified by a decrease in the frequency of head dip, was observed for animals administered with the plant extract compared with untreated control ($p < 0.05$). The reduction of formalin-induced paw edema was significant ($p < 0.01$) at 50 mg/kg of the plant extract, when compared with the control. The methanol extract of *J. tanjorensis* leaf is therefore a potential source of plant medicine with remarkable pharmacological activities.

Keywords: *Jatropha tanjorensis*, anxiolytic, antidepressant, anti-inflammatory, antioxidant, phytochemicals.

Introduction

Plants have long been an important element of ethnomedicine and human nutrition (Liu et al. 2004, Divya et al. 2017). There are over four hundred thousand flowering species that have medicinal applications and properties (Hagazy et al. 2020). The World Health Organization (WHO) now encourages the treatment and management of various diseases and medical conditions with traditional remedies from plant sources (WHO 2019). These plants are widely available in Sub-Saharan Africa, including Nigeria. They are effective against a variety of ailments and disease conditions (Amorha et al. 2018).

Jatropha tanjorensis (Euphorbiaceae) is a shrub. It originated from Central America but has spread across many countries in Africa, North America and Asia (Oladele et al. 2020). In Nigeria, it is extensively used as a vegetable and a major component of some herbal remedies (Ebe et al. 2019). The plant is known locally as 'hospital-too-far', 'Iyana

Ipaja*'* or 'lapalapa*'*. It is also called '*Catholic vegetable'* or '*Reverend father's vegetable'* in southwestern Nigeria; presumably because it is cultivated as an ornamental plant in most Catholic Church premises (Ebenyi et al. 2021).

The plant grows virtually on all soil types without any particular soil circumstance or land preparation. *J. tanjorensis* is a recognized medicinal plant in the southern region of Nigeria where it is often used as a natural medication against diabetes, hypertension, malaria and other infections (Olayiwola et al. 2004). The plant's secondary metabolites have been proven to be responsible for its ability to remedy certain diseases such as diabetes and oxidative conditions (Atansuyi et al. 2012, Ijioma et al. 2014). Extracts from *J. tanjorensis* have been shown to possess antibacterial and anti-anemic potentials, as well as a protective action against xenobiotic-induced organ damage and cardiovascular diseases (Oyewole and Akingbala 2011). It has also been reported that *J. tanjorensis* leaf is rich in essential elements like zinc, phosphorus, selenium, and vitamins C and E. These vitamins and nutrients are associated with antioxidant properties (Ebana et al. 2019). Nevertheless, there is a shortage of comprehensive scientific reports on the antidepressant activity, anxiolytic effect, total antioxidant capacity, in conjunction with the anti-inflammatory property of *J. tanjorensis* leaf. Therefore this investigation was primarily intended to evaluate these biological activities of the methanol extract of homegrown *J. tanjorensis* leaf using different models.

Materials and Methods

Collection, preparation and extraction of *Jatropha tanjorensis* leaf

Jatropha tanjorensis leaf was harvested (in February 2021) from a private garden (6°23′11″ N 5°36′42″ E) at Ugbowo, Benin City, Nigeria. Authentication of the leaf was done in the Plant Biology and Biotechnology Department, University of Benin, Benin City, Nigeria. A voucher number (UBHJ534) was assigned to it and a sample was deposited in the herbarium.

The leaves were subjected to air-drying under shade for three weeks and ground to powder using a blender. The powdered sample was then poured into a polyethylene bag, securely tied and kept for further analysis. The powdered leaf sample was extracted with methanol by cold maceration. The extract was then concentrated to dryness using a freeze dryer (NANBEI, LGJ-10-1-#8688, China).

Preliminary phytochemical screening

The powdered *J. tanjorensis* leaf was qualitatively screened for bioactive components using previously described methods (Sofowora 1993, Trease and Evans 2002).

Total flavonoid content (TFC)

The total flavonoid content was estimated using standard methods (Gnawali et al. 2013). Briefly, 0.5 mL of the extract (1 mg/mL) was added to 1.5 mL of methanol and mixed thoroughly. Then, 0.1 mL of 10% $AlCl_3$ was added followed by the addition of 0.1 mL of 1 M CH_3COOK and 2.8 mL of distilled water. The mixture obtained was placed in an incubator for 30 minutes at room temperature. A double-beam spectrophotometer (T80 PG Instruments, China) was used to measure the absorbance at 415 nm against a blank. A calibration curve was plotted using 12.5, 25, 50, 75, 100 and 150 mg/L of quercetin and the total flavonoid content was calculated thus:

$$\text{TFC (mg QE/g dry extract (g)} = \frac{\text{concentraton of QE (mg/mL)} \times \text{volume of extract (mL)}}{\text{mass of extract (g)}}$$

QE = Quercetin equivalent. All determinations were done in triplicates.

Total phenolic content (TPC)

Total phenolic content was determined by using the method described by Ebrahimzadeh et al. (2008). In the method, 0.5 mL containing 1000 µg/mL of the plant extract and 0.5 mL of Folin-Ciocalteu's reagent were

separately diluted with 4.5 mL of deionized water and mixed. After 5 minutes, 5 mL of 7% $NaCO_3$ and 2 mL of deionized water were added. The resulting mixture was placed in an incubator at room temperature for 90 minutes and a double-beam spectrophotometer (T80 PG Instruments, China) was used to measure the absorbance at 750 nm against a blank. A calibration curve was prepared using 12.5, 25, 50, 75, 100 and 150 mg/L of gallic acid and the total phenolic content was calculated thus:

$$\text{TPC (mg GAE/g dry extract) (g)} = \frac{\text{concentraton of gallic acid (mg/mL)} \times \text{volume of extract (mL)}}{\text{mass of extract (g)}}$$

GAE = Gallic acid equivalent. The measurements were carried out in triplicates.

***In-vitro* antioxidant study**

A 0.1 mM methanol solution of 1, 1-diphenyl-2-picrylhydrazyl (DPPH) was used in this study. With the aid of a micropipette, 1.0 mL of the DPPH solution was added to 3.0 mL of the plant extract at concentrations of 5, 10, 25, 50, 100 and 200 µg/mL in different test tubes and agitated vigorously. The test tubes were left to stand for 30 minutes. Thereafter, each absorbance was recorded at 517 nm (Jain et al. 2008). The radical scavenging activity was calculated as:

$$\%\ \text{DPPH scavenging} = \frac{\text{Absorbance of blank} - \text{Absorbance of test sample}}{\text{Absorbance of blank}} \times 100$$

The %DPPH scavenging activity was plotted against the concentration of the sample and from the plot, the concentration of the plant extract which produced 50% inhibition (IC_{50}) was obtained. Ascorbic acid was used as the standard.

Experimental animals

Fifteen (15) randomly selected male and female Swiss mice, weighing 25-30 g, were used as experimental animals in this study. They were procured from the animal house of the Department of Biochemistry at the University of Benin, Nigeria. The mice were kept in the laboratory under 12-hour light and dark cycle for two weeks to allow for acclimatization and they were fed with standard animal feed and water during the period. The animals were handled according to the protocols set by the Faculty of Life Sciences, University of Benin Ethical Committee on the use of experimental animals. The ethical approval number LS21311 was given for the study.

Acute toxicity study

Determination of acute toxicity of methanol extract of *J. tanjorensis* leaf was carried out by using the modified method by Lorke (1983) in adherence to the Organization for Economic Co-operation and Development (OECD): Instruction used in Testing Chemical No. 423 (OECD 2001). The LD_{50} calculation was done by using the formula:

$$LD_{50} = \sqrt{D_0 \times D_{100}}$$

where: D_0 = Highest dose with no mortality, D_{100} = Lowest dose with mortality.

Antidepressant activity

Experimental protocol

Fifteen Swiss mice were randomly grouped into five (5) of three (3) animals each. Only distilled water at a dose of 0.2 mL/kg was given to the negative control group, while 10 mg/kg of amitriptyline was used to treat the positive control group by oral administration. The other three groups were treated with the methanol extract of *J. tanjorensis* leaf at doses of 50, 100 and 200 mg/kg.

Forced swim test (FST)

The animals were subjected to force swimming by placing them in transparent jars of 20 cm in height and 14 cm in width, filled with water to a height of 10 cm at 25 ± 2 °C. The period of immobility was noted and

measured for 300 seconds. The time used by a rat floating on the water without attempting to swim was taken as the immobility duration. Twenty-four hours before the FST experiment, all the animals were tested for fitness by subjecting them to a 15-minute swimming session as prescribed by the standard method (Yildiz et al. 2000).

Tail suspension test (TST)

The tail suspension test was carried out using methods described by Steru et al. (1985) and modified by Häuser et al. (2012). A gum tape was used to suspend the rats, 1 cm from the tip of the tail, at a height of exactly 58 cm from the floor. The total immobility period was measured for 300 seconds. Entirely stationary rats were declared immobile.

Anxiolytic study: headboard test (HBT)

This test was carried out with a wooden board of dimensions 40 cm by 60 cm (1 cm thick), with evenly spaced punctures (8 cm in diameter) as illustrated by Perez et al. (1998). The animals were grouped into five (5) with three (3) animals in each group. The negative control group was given 0.2 mL/kg of distilled water orally, while the reference group received 2 mg/kg of diazepam orally. The other groups were given methanol extract of *J. tanjorensis* leaf at graded doses of 50, 100 and 200 mg/kg. After 30 minutes of treatment, the animals were transferred to a board. The number of head dips within 5 minutes was counted using a tally counter.

Anti-inflammatory test: formalin-induced paw edema

The experiment was performed using the method described by Agbaje et al. (2008) with modifications by Joseph et al. (2009). Briefly, fifteen rats of either sex were randomly grouped into five (5) of three (3) rats per group. The negative control group was given 0.5 mL/kg of deionized water orally. Aspirin (acetylsalicylic acid) was administered to the positive control group at 100 mg/kg. Other groups were orally treated with *J. tanjorensis* leaf extract at doses of 50, 100 and 200 mg/kg. All treatments were done 30 minutes before the induction of inflammation. Paw edema was induced through a sub-plantar insertion of 0.1 mL aqueous suspension of formalin (6% w/v) into the hind paw of the animals. The injection was given on the left hind paw of rats in the tested groups while the right hind paw was used for the control group.

Statistical analysis

Results obtained are presented as mean ± SEM using version 7 of GraphPad prism, USA. Data were further analyzed using ANOVA and Duncan test. Significant difference was accepted at 95% confidence level ($P < 0.05$).

Results

Preliminary phytochemical screening

The results of the qualitative phytochemical screening of *J. tanjorensis* leaf are presented in Table 1. Saponins, phenolic compounds, flavonoids, tannins, terpenoids, eugenols and alkaloids were detected while steroids were not detected.

Table 1: Qualitative phytochemical profile of methanol extract of *J. tanjorensis* leaf

Phytochemical	Inference
Saponins	+
Phenolic compounds	+
Flavonoids	+
Tannins	+
Terpenoids	+
Eugenols	+
Steroids	-
Alkaloids	+

Key: + = present and - = not detected.

Total flavonoid (TFC) and total phenolic (TPC) contents

Table 2 shows the TFC and TPC of the methanol extract of *J. tanjorensis* leaf. The equation for the standard curve for TFC was y = 0.0128x - 0.1928 and R^2 = 0.9204. The result was expressed as milligrams of quercetin equivalents (QE) per gram of extract and a value of 145.922 ± 0.674 QE/g of the extract was obtained. While the equation for the calibration curve for TPC was y = 0.0023x + 0.00221 and R^2 = 0.9698. The result was expressed as milligrams of gallic acids equivalents (GAE) per gram of extract and 36.478 ± 0.007 GAE/g of the extract was obtained.

Table 2: Total flavonoid content (TFC) and total phenolic content (TPC) of methanol extract of *J. tanjorensis* leaf

Parameter	Value
Total flavonoid content (TFC)	145.922 ± 0.674 QE/g extract
Total phenolic content (TPC)	36.478 ± 0.007 GAE/g extract

Data presented as mean ± SEM for triplicate determinations.

***In-vitro* antioxidant study**

The DPPH radical scavenging ability of methanol extract of *J. tanjorensis* leaf increased with increasing concentration of the extract. The highest percentage inhibition of 50.97% was obtained at 200 µg/mL with a corresponding IC_{50} of 185.02 ± 0.87 µg/mL. The standard, ascorbic acid, with an IC_{50} of 5.15 ± 0.65 µg/mL, gave a maximum percentage inhibition of 99.18% at 200 µg/mL.

Acute toxicity study

The result of the acute toxicity studies on the methanol extract of *J. tanjorensis* leaf is displayed in Table 3. This study was done in two phases. In both phases, there were no observable signs of toxicity or death. No mortality was recorded at the highest dose of 5000 mg/kg of the plant extract. Therefore, the LD_{50} of *J. tanjorensis* leaf is greater than 5000 mg/kg.

Table 3: Acute toxicity study of methanol extract of *J. tanjorensis* leaf

Groups	Doses (mg/kg)	Number of lethalities	Percentage mortality	Adverse effect/ Mortality
Control	DW	0/5	0	absent
J. tanjorensis	10	0/5	0	absent
J. tanjorensis	100	0/5	0	absent
J. tanjorensis	1000	0/5	0	absent
J. tanjorensis	1600	0/5	0	absent
J. tanjorensis	2900	0/5	0	absent
J. tanjorensis	5000	0/5	0	absent

DW = distilled water.

Antidepressant activity

The antidepressant study of *J. tanjorensis* leaf extract was carried out using the Forced Swim Test (FST) and the Tail Suspension Test (TST). Both tests are used to measure the degree of immobility of the test animals since one of the major observable characteristics of depression is immobility.

Forced swim test (FST)

The results for the FST are presented in Table 4. Administration of 50 mg/kg of methanol extract of *J. tanjorensis* leaf produced a significant ($p < 0.01$) inhibition of immobility (depression) of 93.30%. A remarkable 100% reduction in immobility was noticed in the treatment group administered with 100 mg/kg of *J. tanjorensis* leaf extract. At 50 and 100 mg/kg,

the extract produced a dose-dependent decrease in exploratory activity in Swiss mice. This was also time-related. Summarily, a significant difference ($p < 0.01$) was observed with both the extract (50 and 100 mg/kg) and amitriptyline (10 mg/kg) compared to the negative control.

Table 4: Anti-depressant effect of methanol extract of *J. tanjorensis* leaf on Swiss mice in the forced swim test

Treatment	Doses (mg/kg)	Immobility (seconds)	% inhibition
Control	DW	179.0 ± 11.55^{a}	0.00
Amitriptyline	10	9.33 ± 1.63^{c}	94.80
J. tanjorensis	50	12.00 ± 1.00^{c}	93.30
J. tanjorensis	100	0.00 ± 0.00^{c}	100.00
J. tanjorensis	200	34.33 ± 1.45^{b}	80.80

[a] = values not significant compared to the negative control; [b] = values for $p < 0.05$, [c] = values for $p < 0.01$; d = values for $p < 0.001$; DW = distilled water.

Tail suspension test (TST)

Table 5 shows the results for TST for rats treated with methanol extract of *J. tanjorensis* leaf at doses of 50, 100 and 200 mg/kg and 10 mg/kg of the standard drug (amitriptyline). After the plant extract was administered (50 and 100 mg/kg), there was a significant reduction ($p < 0.01$) in the immobility time of the test animals compared to the negative control. This suggests that the methanol extract of *J. tanjorensis* leaf is likely sedative in nature.

Table 5: Anti-depressant effect of methanol extract of *J. tanjorensis* leaf on Swiss mice in tail suspension test

Treatment	Doses (mg/kg)	Immobility (seconds)	% inhibition
Control	DW	122.00 ± 12.70^{a}	0.00
Amitriptyline	10	25.00 ± 3.46^{c}	79.50
J. tanjorensis	50	38.33 ± 1.20^{c}	68.60
J.tanjorensis	100	38.06 ± 1.74^{c}	68.80
J. tanjorensis	200	37.33 ± 2.35^{c}	69.40

[a] = values not significant compared to the negative control; [b] = values for $p < 0.05$ [c] = values for $p < 0.01$; DW = distilled water.

Anxiolytic study: headboard test

The anxiolytic effect of the methanol extract of *J. tanjorensis* leaf was determined by observing the frequency of head-dipping of the test animals in comparison with the control as shown in Figure 1. The highest display of anxiety was observed when 200 mg/kg of the plant extract was administered to the mice while the least activity was observed at 50 mg/kg. This implies that 50 mg/kg of the extract is the optimum dose for this study since it gave the maximum reduction in the restlessness of the test animals.

Anti-inflammatory test: formalin-induced paw edema

Table 6 shows the results of the anti-inflammatory investigation of the methanol extract of *J. tanjorensis* leaf. Paw edema was induced in the rats using formalin and treatment was done for 4 hours.

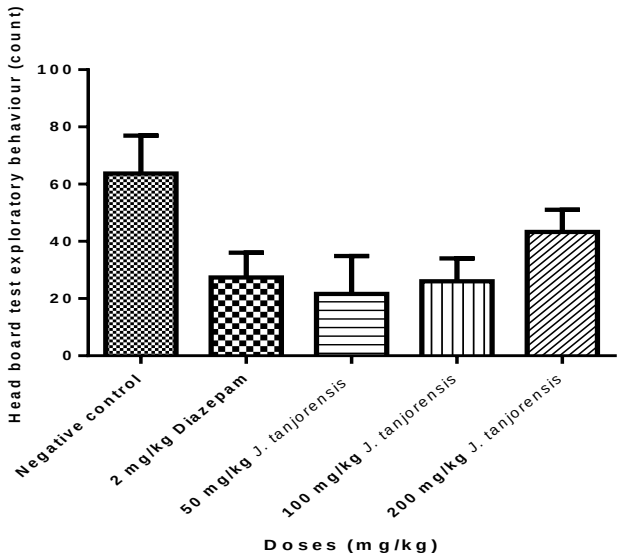

Figure 1: Anxiolytic effect of methanol extract of *J. tanjorensis* leaf in head dip test in mice.

Table 6: Effect of methanol extract of *J. tanjorensis* leaf on formalin-induced hind paw edema in Wistar rats

Treatment	Doses (mg/kg)	Paw thickness (mm) 1 hr	2 hrs	3 hrs	4 hrs
Control	DW	3.77 ± 0.18^{a}	$3.93 \pm 0.1.9^{a}$	4.23 ± 0.17^{a}	4.33 ± 0.23^{a}
Acetylsalicylic acid	100	3.10 ± 0.15^{b}	3.13 ± 0.09^{b}	3.20 ± 0.12^{b}	3.23 ± 0.12^{a}
J. tanjorensis	50	3.40 ± 0.10^{a}	3.03 ± 0.07^{c}	2.93 ± 0.07^{c}	2.90 ± 0.31^{b}
J. tanjorensis	100	3.30 ± 0.10^{a}	3.23 ± 0.12^{b}	3.87 ± 0.27^{a}	3.63 ± 0.15^{a}
J. tanjorensis	200	3.17 ± 0.03^{b}	3.23 ± 0.07^{b}	3.53 ± 0.18^{a}	3.70 ± 0.10^{a}

[a] = values not significant compared to the negative control; [b] = $p < 0.05$. [c] = $p < 0.01$; DW = distilled water.

Discussion

Saponins lower blood cholesterol levels by preventing excess cholesterol from re-absorption into the bloodstream and the non-sugar component of saponins is associated with antioxidant potential (Ebe et al. 2019). This may help in reducing the risks of cardiovascular diseases. Studies have also shown that saponins can significantly reduce gastric ulcers by increasing the percentage protection of gastric lining against ethanol and stress-induced ulcers in experimental animals (Aiwonegbe et al. 2020). Although foods high in tannins are generally low in nutritional value, it has been proposed that drinking beverages that are rich in tannins (such as green teas and red wines) can ameliorate or cure a variety of illnesses, including heart diseases (Daniyan et al. 2018). Terpenes are known to possess cytotoxic properties. Therefore, the presence of terpenoids in *J. tanjorensis* leaf suggests that its extract could be used in the formulation of anti-tumor and anti-viral agents and remedies (Aiwonegbe and Iyasele 2021). The fact that *J. tanjorensis* leaf contains alkaloids further increases the pharmacological significance. This is because it has been scientifically proven that alkaloids have analgesic, antimalarial, antidiabetic and stimulant properties (Erdemoglu et al. 2007, Egunyomi et al. 2009).

The values of TFC and TPC obtained from the analysis of the methanol extract of *J.*

tanjorensis leaf are high enough to be of redox consequence. Other researchers have obtained similar values for TFC and TPC in wild leafy vegetables (Aryal et al. 2019). The redox properties of phenolics make them very strong free radical scavengers and strong antioxidants. They also help to stabilize lipids against peroxidation and inhibit various negative oxidizing actions of enzymes (Rice-Evans et al. 1996). Flavonoids also exhibit antioxidant properties. But as reported in most literatures, the potency of a particular flavonoid is related to its free radical-scavenging ability, the structural malleability, as well as the number and position of the free hydroxyl (OH) groups on it (Panche et al. 2016). Flavonoids are abundant in most plant foods and exhibit a variety of pharmacological activities via complicated mechanisms of action. Major pathological processes such as lipid metabolism, insulin resistance, oxidative stress and inflammation are subtly modulated by flavonoids (Oladele et al. 2020). Therefore, the health-promoting effect of *J. tanjorensis* leaf may be attributed to its flavonoid and phenolic contents.

The results obtained for the preliminary qualitative phytochemical screening of *J. tanjorensis* leaf are similar to the ones obtained in previous studies by Olayiwola et al. (2004), Igbinaduwa et al. (2011) and Ebe et al. (2019).

The antioxidant study using DPPH shows that *J. tanjorensis* leaf has considerable free radical-scavenging ability. It gave an IC_{50} value of 185.02 ± 0.87 µg/mL at 200 µg/mL with a percentage inhibition of 50.97%. Although the observed free radical-scavenging ability is quite low when compared with the reference standard, ascorbic acid (99.18% at 200 µg/mL), it is however comparable with the values obtained for some essential oils by other researchers (Tundis et al. 2012, Sarrou et al. 2013).

The acute toxicity study revealed that the LD_{50} of the methanol extract of *J. tanjorensis* leaf is greater than 5000 mg/kg when administered to rats. This is in congruence with previous research on the toxicity of *J. tanjorensis* leaf using Wistar albino mice (Igbinaduwa et al. 2011). Toxicity studies on medicinal plants help to give improved perceptions of their medicinal properties, effectiveness and safety (Gupta and Bhardwaj 2012).

Antidepressant study shows that the methanol extract of *J. tanjorensis* leaf exerts its sedative effect in a dose-dependent manner. However, the observed decrease in explorative activities showed a significant difference mainly at 50 mg/kg and 100 mg/kg when compared with the standard drug, amitriptyline ($p < 0.01$). The anti-depressant activity exhibited by the extract may be related to the presence of flavonoid and phenolic compounds found in the plant, whose effects on central nervous system disorders are well established (Vongtau et al. 2005). The results obtained from this study are comparable to a similar report on anti-depressant studies of *Ficus platyphylla* Del (Moraceae**)** and *Gaultheria Fragrantissima* (Aishatu et al. 2018, Nongkhlaw et al. 2020).

The headboard test (HBT) for explorative behaviour suggests that the methanol extract of *J. tanjorensis* leaf has psychotropic properties with a concomitant display of less anxiety. One of the commonest forms of mental disorder is anxiety, which is experienced daily. Initially, it manifests in all forms of fear and worries, common with normal human feelings. But when this state of mind is sustained for longer periods, it negatively impacts the mental and physical health of the subject, leading to nervousness and hyperactivity. It could also result in dryness of the mouth, heavy sweating and stomach pains. Research has shown that one-eighth of the entire world population suffers from one form of anxiety or the other (Dang et al. 2009). Anxiety is mostly due to the over-secretion of acetylcholine which brings about an imbalance in the neurotransmitter levels in the central nervous system (Onasanwo et al. 2010). There is an established direct proportionality relationship between anxiolytic activity and head-dipping in experimental animals (Takeda et al. 1998). The observed decrease in head-dipping by the animals shows that the extract has sedative effects. Therefore, some of the components present in the methanol extract of *J.*

tanjorensis leaf possess psychotropic potentials, which warrant additional chemical and clinical investigations.

The anti-inflammatory study of the methanol extract of *J. tanjorensis* leaf revealed that after treating the experimental animals for 1 hour, 200 mg/kg of the extract displayed a competitive anti-inflammatory action with the positive control, i.e., acetylsalicylic acid (100 mg/kg). However, there was no significant difference between the other treatment groups (50 and 100 mg/kg). A significant reduction ($p < 0.01$) in inflammation was observed when 50 mg/kg of *J. tanjorensis* leaf extract was administered for 2 hours. A threshold was observed across the treatment groups at 4 hours. Therefore, therapeutically, 50 mg/kg of the methanol extract of *J. tanjorensis* leaf shows its potency in 4 hours in the management of inflammation.

Conclusion

The methanol extract of home-grown *Jatropha tanjorensis* leaf showed significant biological activities of great relevance in pharmacology. The positive preliminary results obtained from the in-vitro study of the anxiolytic and anti-inflammatory properties of the leaf extract, using Swiss mice, give credence to the pharmacological potential of *Jatropha tanjorensis.* Therefore, a formulation of this leaf extract holds promise as a suitable alternative therapy for treating and managing related disease conditions, especially inflammatory illness, as very low doses of the leaf extract were required for effective treatment in experimental animals. However, more studies are required to explore the mechanism of the suppression of anxiety and inflammation. The plant extract also displayed some antioxidant properties in scavenging DPPH radicals. This further buttresses the vast pharmaceutical, medicinal and therapeutic properties of the chemical compounds in *Jatropha tanjorensis* leaf extract. Therefore, isolation and structural elucidation of the phytochemicals in the plant extract is recommended.

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