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Pharmacognostic and fertility enhancing investigation of *Desmodium scorpiurus* sw. Desv. (Fabaceae) whole plant extracts

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Abstract
This study aims at evaluating the pharmacognostic features and fertility enhancing potential of *Desmodium scorpiurus*. The fresh and powdered plant materials were subjected to macroscopy, microscopy, physicochemical, qualitative and quantitative phytochemical analysis using official methods. The powdered plant was extracted successively by maceration using petroleum ether, ethyl acetate, methanol and distilled water respectively. The four extracts were evaluated for acute oral toxicity at a dose of 2000 mg kg^{-1} body weight in mice. Preliminary fertility enhancing potential of 80% methanol extract of *D. scorpiurus* was assessed using *Drosophila melanogaster*. Microscopy revealed paracytic and anisocytic stomata, glandular and non-glandular trichomes, calcium oxalate prisms, starch grains and pitted vessels. Alkaloids, saponins, tannins, flavonoids, steroid, terpene and cardiac glycosides were present in the extracts of *D. scorpiurus*. The acute toxicity assay showed that all plant extracts were safe even at a dose of 2000 mg/kg. The preliminary fertility enhancing potential investigated in this study showed that *D. scorpiurus* improve fertility in fruit fly. Higher number of flies' emergence were observed at 5, 50 and 1000 mg/10 g diet of *D. scorpiurus* extract for group 1 and at 25, 100 and 500 mg/10 g diet for Group 2, compared with the control.

Keywords: *Desmodium scorpiurus*; *Drosophila melanogaster*; Fertility; Pharmacognostic

INTRODUCTION

Pharmacognostic studies play a crucial role in drug discovery from plants as such studies assist in the proper identification of species by providing standardisation parameters that help prevent adulteration. These studies contribute to the authentication of medicinal plants and ensure the reproducible quality of herbal products, which promotes the safety and efficacy of natural remedies [1]. Infertility is defined as the inability to conceive after 12 months of engaging in unprotected sexual intercourse [2]. This is a global issue affecting approximately 8 to 12% of couples [3]. Infertility is one of the significant challenges of contemporary life; as a source of psychological crisis, it places considerable stress on affected couples and poses various threats to their mental well-being.

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Consequently, the rates of divorce and remarriage among infertile couples have increased [4]. In certain regions of Nigeria, studies indicate that infertility rates can be as high as 20% to 45% [5]. Male reproductive health issues are often undervalued; however, male factors contribute to nearly 20 to 70% of infertility cases with the highest rates in Africa and Europe [6], [7]. The World Health Organisation (WHO) states that 10-15% of couples have faced some form of infertility, with 40% of these cases attributed to male factors [8], [9]. More than three out of every 10 Nigerian men have reported experiencing erectile dysfunction or other sexual disorders [10]. Various treatments, including surgery, medications, herbal remedies, and assisted reproductive technologies, are available to address fertility issues. Nevertheless, these treatments can impose a significant financial burden on infertile couples [4].

The genus Desmodium is a large member of the Fabaceae family. It contains about 350 plant species used for both feeding stuffs and herbal medicines, of which only about 30 species have been phytochemically or pharmacologically investigated. Desmodium plant extracts, as well as the active principles, have been experimentally studied for their anti-inflammatory, cytotoxic, antidiabetic, antinephrolithic, antibacterial, and nootropic activities *in vitro* or *in vivo* [11].

And so far, a total of 212 compounds have been isolated from 15 Desmodium species and characterized mainly as flavonoids and alkaloids, followed by terpenoids, steroids, phenols, phenylpropanoids, glycosides and a number of volatile oils. The remaining unrevealed species are recorded chiefly in Asia and Africa being used in empirical treatment for various diseases" [11]. Some species of the Desmodium genus such as the aqueous leaf extract of *Desmodium velutinum* have been shown to possess aphrodisiac and pro-fertility effect on Male Wistar Rats [12]. *Desmodium gangeticum* DC has also been shown to contain gangetin capable of impairing fertility [13].

D. scorpiurus is a prostrate perennial legume that spreads readily from its trailing, climbing, or procumbent hairy stem up to 50cm long. The common name is Samoan clover or scorpion tick trefoil, and the local name is tsintsiyar maza in Hausa. *D. scorpiurus* originated from tropical America and is widespread in the tropics. It is present in Western Africa from Senegal to Nigeria, and Cameroun. This plant is commonly used in the Northern part of Nigeria by traditional medicine practitioners to treat male infertility. In Nigeria, extracts of *D. scorpiurus* were found to have anti-inflammatory activity [14]. Important *in vitro* antibacterial activity of extracts of aerial parts of *D. scorpiurus* (extracted with petroleum spirit, chloroform, or methanol) was also observed against *Pseudomonas aeruginosa, Escherichia coli, or Streptococcus pyogenes* [15].

Several studies have shown that botanical medicines have a positive effect on sperm parameters. Alternative therapies, such as herbal plants, can be beneficial in increasing fertility due to their antioxidant power and low side effects [16]. This plant will be evaluated for its pharmacognostic features, phytochemical constituents, and fertility potential to provide scientific backing for its traditional use.

EXPERIMENTAL METHODS

Plant collection and identification. The whole plant was collected between October and November 2023 from Bauchi State, Nigeria. It was identified and authenticated by a Taxonomist at the herbarium of the College of Forestry in Jos. Herbarium specimens of the plant were prepared and deposited at the same institution's herbarium and the Faculty of Pharmaceutical Sciences at the University of Jos with Voucher number UJ/PCG/HSP/17F07 for reference. About 20 kg of the dried plant material is required. The whole plant of *D. scorpiurus* was sorted to eliminate unwanted

particles and dead matter, after which it was air-dried in the shade for 2 weeks, then ground into powder, and preserved according to standard methods [17].

Pharmacognostic evaluation and phytochemical screening. Pharmacognostic evaluation, including organoleptic, macroscopic, microscopic, and physicochemical studies, were conducted using standard methods [17], [18]. The plant was screened qualitatively for its phytochemical constituents following standard procedures [17], [18]. Quantitative phytochemical screening was also performed using the powdered whole plant. The quantity of saponins, tannins, steroids, alkaloids and flavonoids were determined according to the methods of Ezeonu & Ejikeme [19].

Percentage of flavonoids. Exactly 50 mL of 80% aqueous methanol added was added to 2.50 g of the whole plant powder in a 250 mL beaker, covered, and allowed to stand for 24 hours at room temperature. After discarding the supernatant, the residue was reextracted (three times) with the same volume of ethanol. Whatman filter paper number 42 (125 mm) was used to filter whole solution. The filtrate was later transferred into a crucible and evaporated to dryness over a water bath. The content in the crucible was cooled in a desiccator and weighed until constant weight was obtained. The flavonoid content was calculated as a percentage as follows:

$$\%\ Flavonoids = \frac{Weight\ of\ flavonoids}{Weight\ of\ sample} \times 100 \qquad (1)$$

Percentage of tannins. Powdered whole plant (1 g) was added to 100 mL of distilled water. This was boiled gently for 1 hour on an electric hot plate and filtered using number 42 (125 mm) Whatman filter paper in a 100 mL volumetric flask. Addition of 5.0 mL Folin-Denis reagent and 10 mL of saturated Na_2CO_3 solution into 50 mL of distilled water and 10 mL of diluted extract (aliquot volume) was carried out after being pipetted into a 100 mL conical flask for colour development. The solution was allowed to stand for 30 minutes in a water bath at a temperature of 25°C after thorough agitation. With the aid of a Spectrum Lab 23A spectrophotometer optical density was measured at 700 nm and compared on a standard tannic acid curve. The following formula was used in the calculation:

$$\%\ Tannins = \frac{C \times extract\ volume \times 100}{Aliquot\ volume \times weight\ of\ sample} \qquad (2)$$

Where C is concentration of tannic acid read off the graph.

Percentage of saponins. Exactly 100 mL of 20% aqueous ethanol was added to 5 g of each whole plant powder sample in a 250 mL conical flask. The mixture was heated over a hot water bath for 4 hours with continuous stirring at a temperature of 55°C. The residue of the mixture was reextracted with another 100 mL of 20% aqueous ethanol after filtration and heated for 4 hours at a constant temperature of 55°C with constant stirring. The combined extract was evaporated to 40 mL over water bath at 90°C. Diethyl ether (20 mL) was added to the concentrate in a 250 mL separator funnel and vigorously agitated from which the aqueous layer was recovered while the ether layer was discarded. Then, 60 mL of *n*-butanol was added and extracted twice with 10 mL of 5% sodium chloride. After discarding the sodium chloride layer the remaining solution was heated in a water bath for 30 minutes, after which the solution was transferred into a crucible and was dried in an oven to a constant weight. The saponin content was calculated as a percentage as follows:

$$\%\ Saponins = \frac{Weight\ of\ saponins}{Weight\ of\ sample} \times 100 \qquad (3)$$

Percentage of alkaloids. Whole plant powder (5 g) was dissolved in 40 mL of 10% ethanolic acetic acid, and allowed to stand for 4 hours at room temperature. This was then filtered with Whatman filter paper (No 42) before concentrating by evaporation over a steam bath

to ¼ of the original volume. The alkaloid was precipitated by adding drops of conc. Ammonia solution until in excess. The resulting alkaloid precipitate was recovered by filtration using previously weighed filter paper (w_1). The precipitate was washed with 9% ammonia solution, dried in the oven at 60°C for 30 minutes and cooled in a desiccator, then reweighed (w_2). The percentage of alkaloids was then calculated as follows:

$$\%\ Alkaloids = \frac{w2-w1}{Weight\ of\ sample} \times 100 \qquad (4)$$

Percentage of steroids. The powdered sample (5 g) was weighed into a cleaned beaker, hydrolysed by boiling in 50 mL of conc. hydrochloric acid for 30 minutes and filtered with Whatman filter paper (no 42). The filtrate was transferred into a separating funnel. Equal volume of ethyl acetate was added to the filtrate, mixed thoroughly and allowed to separate into two layers. The ethyl acetate layer (extract) was recovered, while the aqueous layer is discarded. The extracted steroid was dried on a steam bath at 100°C for 5 minutes, then the turbid mixture was filtered properly with a pre- weighed filter paper (w1). The steroid extract was dried in the oven, then cooled in a desiccator and reweighed (w2). The concentration of steroid was determined and expressed as a percentage thus:

$$\%\ Steroids = \frac{w2-w1}{Weight\ of\ sample} \times 100 \qquad (5)$$

Extraction. Four solvent systems (petroleum ether, ethyl acetate, 70% aqueous methanol, and water) were used to successively extract the plant. The petroleum ether, ethyl acetate, and methanol extracts were concentrated using a rotary evaporator and stored at 4°C until needed. The aqueous extracts were lyophilized and kept for further work.

Ethical clearance. The research was conducted in accordance with US guidelines (NIH publication #85-23, revised in 1985) for laboratory animal use and care. Ethical clearance was obtained from the Faculty of Pharmaceutical Sciences Ethics Committee at the University of Jos, with ethical clearance number F17-00379 for reference.

Acute toxicity test. The study was conducted following the Organisation for Economic Cooperation and Development's oral toxicity fixed dose procedure [Test guideline No. 420, Section 4], adopted on December 17, 2001 [20]. Eight mice of both sexes (8-12 weeks old) were obtained from the Animal Facility of the Department of Pharmacology at the Faculty of Pharmaceutical Sciences, University of Jos, Nigeria. The animals were allowed to acclimate for one week before dosing under standard conditions. Mice were divided into five groups: Group 1 received pet ether extract, Group 2 received ethyl acetate extract, Group 3 received methanol extract, Group 4 received aqueous extract, and Group 5 received normal saline as a control. The extracts of *D. scorpiurus* were suspended in normal saline and administered orally as a single dose in a sequential manner to one animal at a dose level of 2000 mg/kg in the sighting study, and to four animals per sex at 2000 mg/kg in the main study. The experimental animals were fasted overnight before dosing. On the day of dosing, all animals were monitored for mortality and clinical signs at the following intervals: 10 minutes, 30 minutes, 1 hour, 2 hours, 4 hours, and 6 hours after dosing, and subsequently twice daily for mortality and once daily for clinical signs for 14 days.

Fertility enhancing ability using *D. melanogaster*. A preliminary assay was conducted to evaluate the fertility potential of the whole plant of *D. scorpiurus.* In this assay, *D. melanogaster* was exposed to 80% methanol extract of *D. scorpiurus* and were pair-mated in vials containing standard food. Pair mating was implemented using two strategies for each treatment group, with 10 pairs of flies per group. (a) Males exposed to the extracts (5, 10, 25, 50, 100, 250, 500, and 1000 mg/10g diet of *D. scorpiurus*) were paired with unexposed virgin females, and (b) unexposed males were paired with virgin

females treated with the extracts (5, 10, 25, 50, 100, 250, 500, and 1000 mg/10g diet of *D. scorpiurus*) for 24 hours, respectively.

All flies in each treatment group were placed in fresh vials with normal food for 24 hours. The male and female flies were collected, and the eggs in each vial were monitored daily until emergence. The total number of flies that emerged was counted until the final emergence. [21].

Statistical analysis. Data were analysed as mean ± Standard Error of Mean (SEM). Results were presented as tables and bar charts.

RESULTS

Macroscopy. The microscopical evaluation revealed that the leaf of *D. scorpiurus* is compound, petiolate, elliptic or ovate in shape. Its margin is entire, apex acute and venation is pinnate (Table 1) (Plate 1). The powdered plant is green in colour with basic taste.

Microscopy. The microscopic features of the fresh leaf and powder of *D. scorpiurus* are described in Table 2. Diagnostic features such as stomata, trichome, calcium oxalate crystals, and starch grains were identified (Plate 2 to 4).

Preliminary phytochemical screening of extracts of *D. scorpiurus* whole plant. The following secondary metabolites were identified in the four extracts of *D. scorpiurus* whole plant (Table 3).

Quantitative phytochemical screening of *D. scorpiurus* whole plant. The quantitative phytochemical screening revealed that *D. scorpiurus* whole plant is made up of mostly tannins (24.99 %) followed by steroids (8.10 %), alkaloids (2.76 %), flavonoids (1.44 saponins %) and (0.82 %) respectively (Table 4).

Physicochemical evaluation of *D. scorpiurus* whole plant. Physicochemical parameter required for quality control of the whole plant of *D. scorpiurus* are shown in Table 5.

Acute toxicity test. The OECD method was employed for this toxicity testing. Four extracts (Pet. Ether, Ethyl acetate, methanol and aqueous) were tested. Healthy young adult mice (17 to 23 g) were used. At 2000 mg/kg, all extracts tested were safe as no fatality was recorded and no signs of toxicity observed at the end of 14 days of administration (Table 6).

Plate 1. A- Whole plant of *D. scorpiurus*; B- *D. scorpiurus* in its natural habitat

Table 1: Macroscopic features of the leaf of *D. scorpiurus*

Macroscopic character		Result
Colour		Green
Texture		Hairy, rough on both sides (Pubescent)
Margin		Entire
Apex		Acute
Venation		Pinnate
Shape		leaves are compound, leaflets are elliptic or ovate in shape
Taste		Basic
Size (cm)	Length	5.64±0.69
	Width	2.89±0.30
	Petiole	3.39±0.39

Values in the table are mean ± SEM; n=10

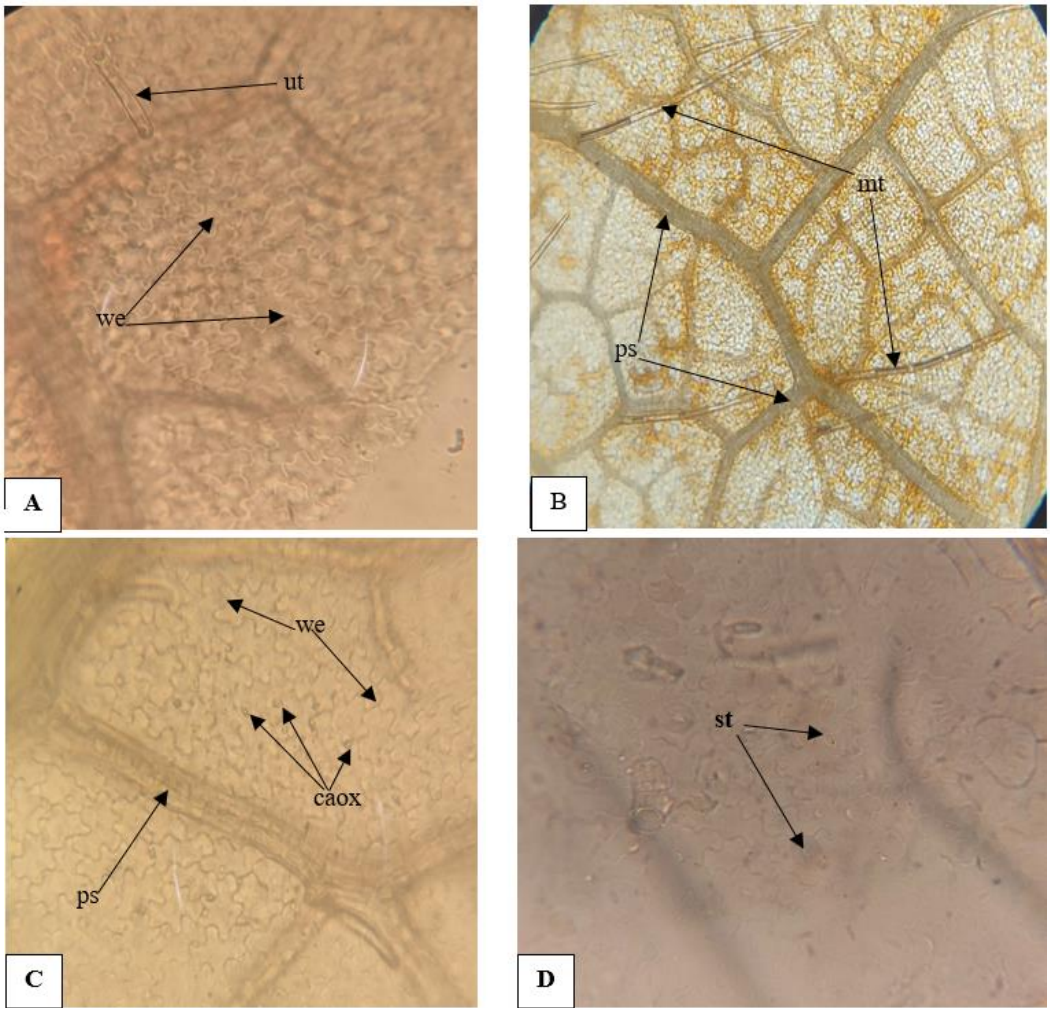

Plate 2: Photomicroscopy of the Upper Epidermis of the Fresh Leaf of *Desmodium scorpiurus*

A. Showing wavy epidermal walls and unicellular uniseriate covering trichomes, the trichomes are blunt, thick with large lumen (magnification x400). (ut= unicellular covering trichomes; we: wavy epidermal walls)

B. Showing multi cellular uniseriate covering trichomes, the trichomes are thin with narrow lumen and tapering end. Prism sheaths can also be seen (magnification x100). (mt= multi cellular uniseriate covering trichomes; ps =Prism sheath)

C. Showing wavy epidermal walls covered by calcium oxalate prisms (magnification x400). (we: wavy epidermal walls; caox: calcium oxalate crystals; ps =Prism sheath)

D. Showing anisocytic stomata surrounded by three unequalled subsidiary cells (magnification x400). (st: stomata)

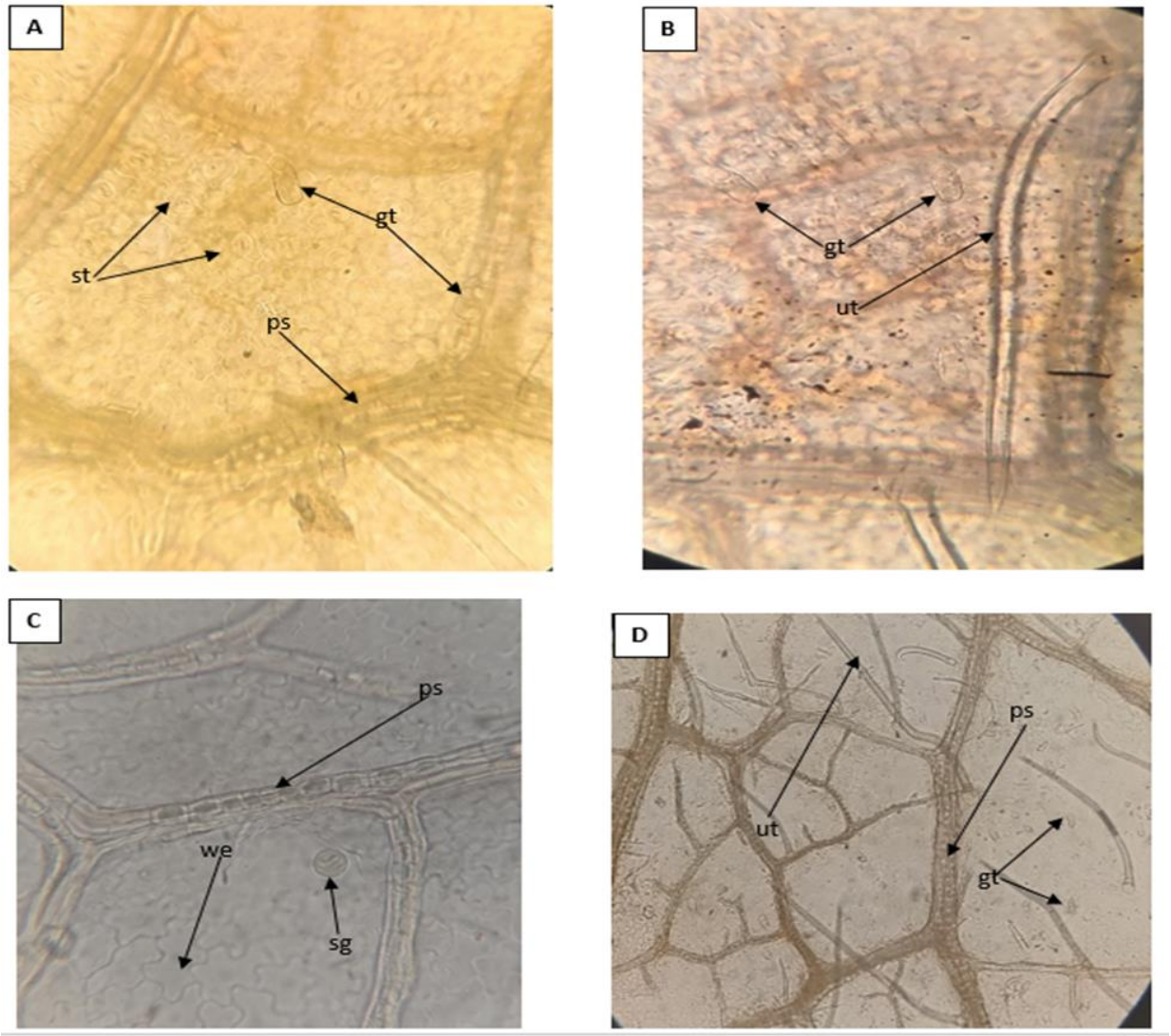

Plate 3: Photomicroscopy of the Lower Epidermis of the Fresh Leaf of *Desmodium scorpiurus*

A. Showing numerous paracytic stomata, wavy epidermal walls, glandular unicellular head, unicellular tail trichomes with prism calcium oxalate crystal sheath all over the veins (magnification x400). (st= paracytic stomata; gt= glandular unicellular head, unicellular tail trichomes; ps =Prism sheath)

B. Showing glandular unicellular head, unicellular tail trichomes and unicellular covering trichome lengthy with tapering end and narrow lumen (magnification x400). (gt= glandular unicellular head, unicellular tail trichomes; ut: unicellular covering trichome)

C. Showing wavy epidermal walls, prism sheaths and starch grain with hilium and striations (magnification x100). (we: wavy epidermal walls; ps =Prism sheath ps= prism sheath; sg= starch grain)

D. Showing several unicellular covering trichome lengthy with tapering end and narrow lumen. Several glandular unicellular head unicellular tail trichomes, prism sheaths can also be seen (magnification x100). (ut: unicellular covering trichome; gt= glandular unicellular head, unicellular tail trichomes; ps= prism sheath

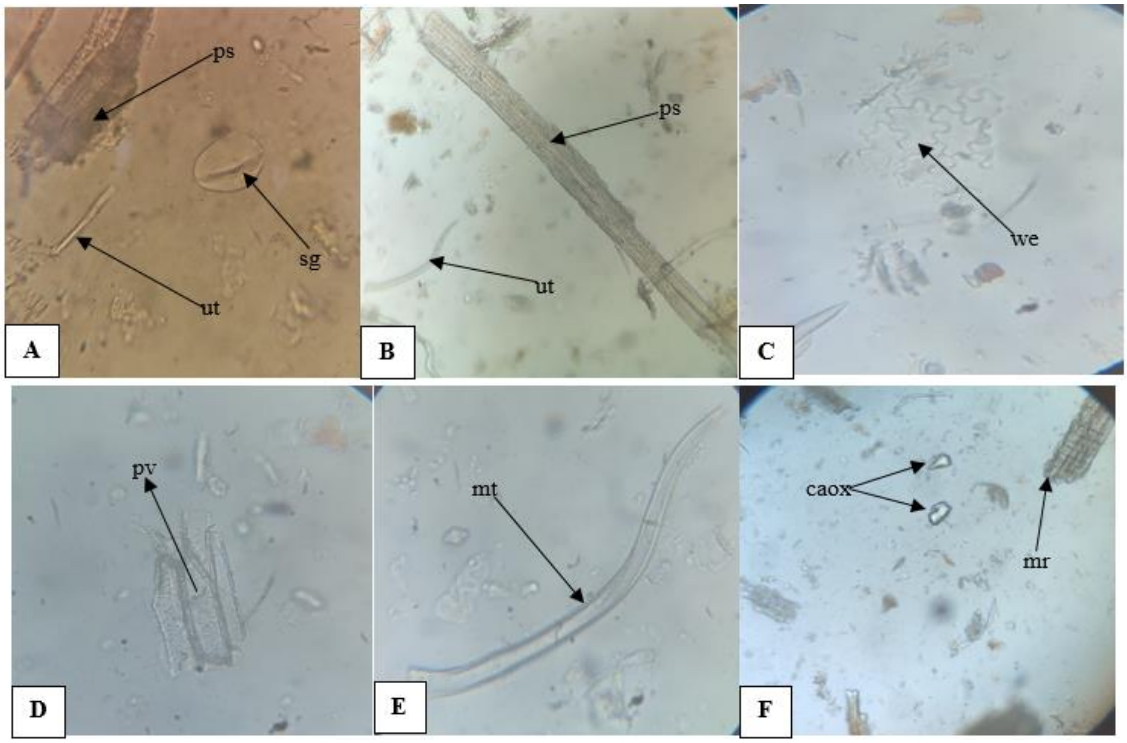

Plate 4: Photomicroscopy of the powder of *D. scorpiurus* whole plant

A. Showing unicellular uniseriate covering trichome, the trichome is blunt, thick with large lumen. Oval shaped starch grains with central open hilum and striation. Prism sheath can also be seen (magnification x400). (ut= unicellular covering trichomes; sg= starch grain; ps =Prism sheath)
B. Showing prism sheath, and unicellular covering trichome lengthy with tapering end and narrow lumen (magnification x100). (ps =Prism sheath; ut: unicellular covering trichome)
C. Showing wavy epidermal walls (magnification x400). (we= wavy epidermal walls)
D. Showing bordered pitted vessel (magnification x400). (pv= pitted vessel)
E. Showing multi cellular uniseriate covering trichomes, the trichomes are thin with narrow lumen and tapering end. (magnification x400). (mt= multi cellular uniseriate covering trichomes)
F. Showing medullary ray and prism calcium oxalate crystal (magnification x100). (mr= medullary ray; caox= calcium oxalate crystal)

Table 2: Comparison of the microscopic features of the fresh leaf (upper and lower epidermis) and whole plant powder of *D. scorpiurus*

Features	Upper epidermis (Plate 2)	Lower epidermis (Plate 3)	Whole plant powder (Plate 4)
Epidermal wall	Wavy	Wavy	Wavy
Stomata	Anisocytic	Paracytic	None
Trichomes	Several unicellular uniseriate covering trichome, blunt and thick with large lumen	Abundance of glandular unicellular head, unicellular tail trichome	Unicellular uniseriate covering trichome, lengthy with tapering end and narrow lumen
	Few multicellular uniseriate trichome	Covering trichome lengthy with tapering end and narrow lumen	Unicellular uniseriate covering trichome, blunt, thick with large lumen
Calcium oxalate crystals	Calcium oxalate prism in abundance. Prism sheath numerous all over the veins of the leaf	Calcium oxalate prism in abundance. Prism sheath numerous all over the veins of the leaf	Calcium oxalate prism, prism sheaths
Starch grains	None	Round shaped starch grains with central open hilum and concentrically striated	Oval shaped starch grains with central open hilum and concentrically striated
Vascular bundle	None	None	Bordered pitted vessel

Table 3: Phytochemicals in the extracts of *D. scorpiurus* whole plant

Constituents	Pet. Ether Extract	Ethyl Acetate Extract	Methanol Extract	Aqueous Extract
Alkaloids	-	-	+	+
Saponins	-	-	+	+
Tannins	-	-	+	+
Flavonoids	-	+	+	+
Steroids	+	+	+	-
Terpenes	+	+	+	-
Anthraquinones	-	-	-	-
Cardiac glycosides				
Keller Kiliani	+	+	+	+
Legal test	-	-	+	+

Present: + Absent: -

Table 4: Quantity of phytochemicals in powder of *D. scorpiurus* whole plant

Phytochemical	Percentage (%)
Saponins	0.82
Tannins	24.99
Steroids	8.10
Alkaloids	2.76
Flavonoids	1.44

Table 5: Physicochemical parameters of the whole plant of *D. scorpiurus*

Parameter	Percentage (%)
Moisture content	5.83 ± 0.01
Total ash value	5.66 ± 0.21
Water soluble ash	1.02 ± 0.02
Acid insoluble ash	0.64 ± 0.01
Ethanol soluble extractive value	1.64 ± 0.02
Water soluble extractive value	2.19 ± 0.03

Values are mean±SEM; n=3

Table 6: Acute toxicity test

Extracts	Dosage (mg/body weight)	No of Mice	Mortality
Normal saline (Control)	2000	4	0/4
Pet. Ether	2000	4	0/4
Ethyl acetate	2000	4	0/4
Methanol	2000	4	0/4
Aqueous	2000	4	0/4

Preliminary reproductive bioassay of *D. scorpiurus* using *Drosophila melanogaster*. A preliminary assay was conducted using *D. melanogaster* to ascertain the fertility potential of *D. scorpiurus*. Pair mating was done using two strategies for each treatment group as shown below:

A. ***D. scorpiurus* (male treated and crossed with untreated female).** Figure 1 shows the total number of flies that emerged from eggs laid following the copulation of Male flies treated with *D. scorpiurus* crossed with untreated female. At the end of 30 days, the number of flies that emerged from each treated group were more than the control (56 flies), except for the grouped treated with 100 mg/ml of the extract, where emergence was lower (40 flies) than control. Fly emergence in groups treated with 5 mg/ml, 50 mg/ml and 1000 mg/ml showed higher fly emergence of 87, 93 and 99 flies respectively. These values are significantly higher than the control.

B. ***D. scorpiurus* (female treated and crossed with untreated male).** The total number of flies that emerged from eggs laid following the copulation of female flies treated with *D. scorpiurus* crossed with untreated male. At the end of 30 days, the number of flies that emerged from each treated group were more than the control (79 flies), except for the grouped treated with 5 mg/ml of the extract, where emergence was slightly lower (78 flies). Groups treated with 25 mg/ml, 100 mg/ml and 500 mg/ml with higher fly emergence of 108, 113 and 104 flies respectively (Figure 2).

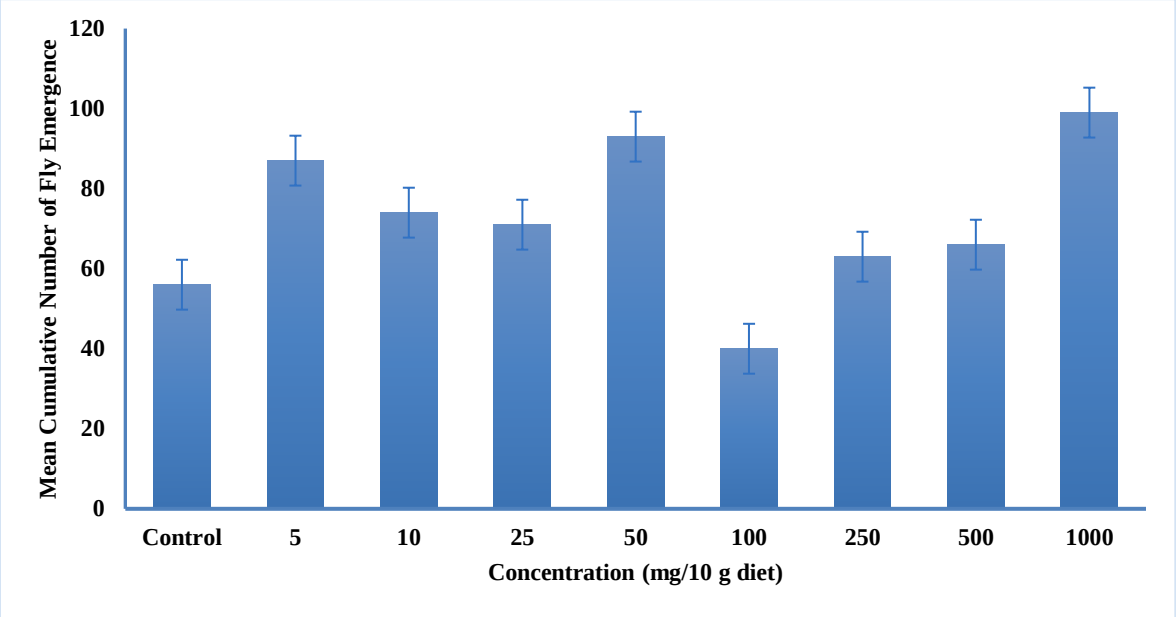

Figure 1. Fly emergence of *Drosophila melanogaster* treated with *Desmodium scorpiurus* (Male treated and crossed with untreated female) n=10

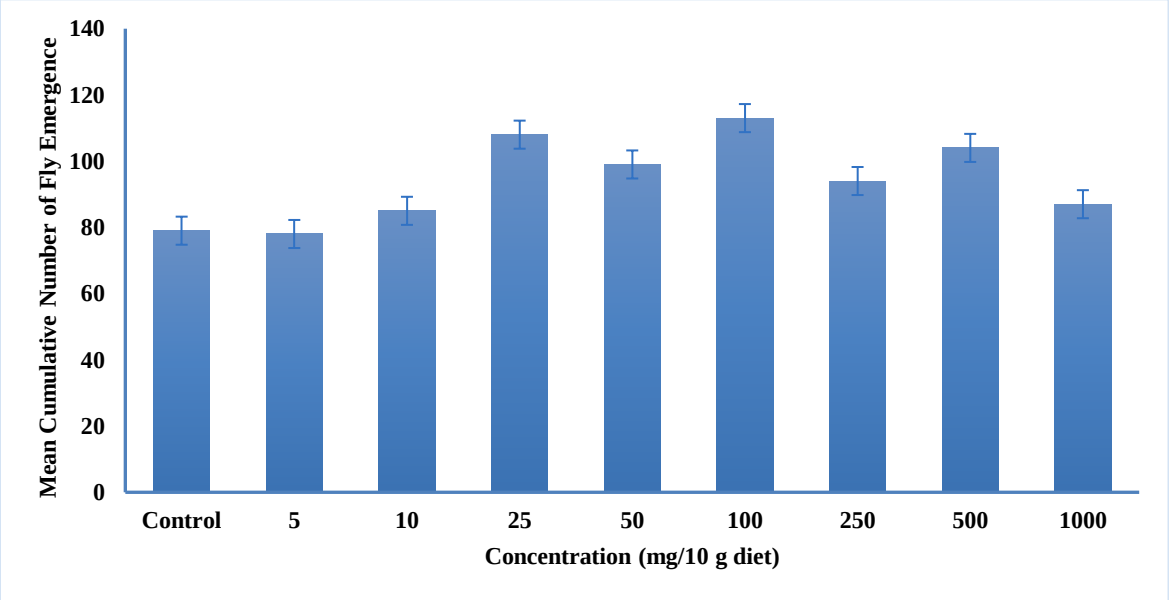

Figure 2. Fly emergence of *Drosophila melanogaster* treated with *Desmodium scorpiurus* (Female treated and crossed with untreated male) n=10

DISCUSSION

D. scorpiurus belongs to a large genus of the Fabaceae family. Desmodium contains about 350 plant species, many of which are morphologically similar. This necessitates the proper identification of the plant, *D. scorpiurus* [11]. Pharmacognostic evaluation aids in the proper identification of the plant by providing important parameters necessary to develop a monograph. The microscopy of the leaf of *D. scorpiurus* revealed the presence of diagnostic characters that can help in the proper identification of the plant. The upper and lower epidermis contained calcium oxalate prism, covering trichomes, starch grains, pitted vessels, and medullary rays. Anisocytic stomata are present on the upper epidermis while the lower epidermis contains paracytic stomata (Table 2, Plate 2 to 3). These findings agree with a study by Rachitha and Krishnaswamy [22] where similar features were seen. The preliminary phytochemical analysis revealed secondary metabolites present in the plant that may be responsible for its therapeutic effects. Alkaloids, saponins, tannins, flavonoids, steroids, terpene, and cardiac glycosides were present in the extracts of *D. scorpiurus* (Table 3). Studies in the past on the phytochemistry of *D. scorpiurus* had documented the presence of similar secondary metabolites [14, 15]. The secondary metabolites quantification showed that *D. scorpiurus* contains mostly tannins (24.99 %) followed by steroids (8.10 %), alkaloids (2.76 %), flavonoids (1.44 %), and saponins (0.82 %) respectively (Table 4).

The purity and quality of the plant were determined by physicochemical analysis. The moisture content is 5.83% (Table 5), lower values of moisture content of drugs could prevent content bacterial, fungal, or yeast growth through storage and it is recommended that the moisture content in crude drugs should not be more than 14% [23]. Moisture content determination helps to provide information that can guide in the proper storage and packaging of the plant because it directly impacts the plant's shelf life, preventing deterioration and spoilage by allowing for optimal conditions to minimize microbial growth and preserve quality [24]. Ash value is the measurement of inorganic matter in a crude drug. It is an important qualitative standard and a key indicator of the quality, purity, and mineral content of a sample [25, 26]. The water-soluble extractive value was higher than alcohol soluble extractive value. It was found to be 2.19% (Table 5). This shows that the constituents of the drug are more extracted and soluble in water as compared to alcohol (1.64 %). This is consistent with the high tannin content of the plant as documented in this study.

The acute toxicity assay showed that all plant extracts (petroleum ether, ethyl acetate, methanol, and aqueous) tested were safe in tested mice at a high dose of 2000 mg/kg. The extracts did not produce mortality or any sign of toxicity (Table 6). The preliminary fertility enhancing assay showed that the methanol extract of *D. scorpiurus* possesses the ability to increase fertility. For the group of treated male flies crossed with untreated female flies, higher fly emergence of 87, 93, and 99 were observed in groups treated with 5 mg/ml, 50 mg/ml, and 1000 mg/ml than the control with fly emergence of 56. For the treated Female flies crossed with untreated male flies, higher fly emergence of 108, 113, and 104 flies were observed in groups treated with 25 mg/ml, 100 mg/ml, and 500 mg/ml respectively as compared with the control (79 flies). Comparing the two major groups, higher emergence was observed in female flies treated with the extract and crossed with untreated males. *D. scorpiurus* is used by traditional practitioners especially in Northern Nigeria for the treatment of male infertility but there seems to be no sufficient scientific evidence to support the claim [27]. This preliminary study using *Drosophila*

melanogaster has provided baseline evidence that this plant possesses fertility potential which can be further investigated through *in vivo* studies.

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