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Phytochemical screening and oil yield of a potential herb, camel grass (*Cymbopogon schoenanthus* Spreng.)

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ABSTRACT

The study was to determine oil yield and phytochemical composition of Cymbopogon schoenanthus. Oil was extracted using 100 ml petroleum ether for each 45 g of pulverized grass. The extracts were evaluated qualitatively for phytochemical analysis and quantitative analysis to determine the chemical composition using Gas Chromatography-Mass Spectrometry (GC-MS). The result obtained for phytochemical screening revealed that alkaloids, balsams, cardiac glycosides, flavonoids, glycosides, saponin, saponin glycosides, steroids, tannins and volatile oils were present. Anthraquinone was not detected. While in each 45 g of pulverized grass sample 6.09 % of oil was obtained. Sixteen (16) Chemical constituents were detected in the oil of C. schoenanthus. Octane was the major constituent in the oil with a peak area (%) of 40.38. The compound present in least quantity was Dodecane 0.58 with peak area (%).

Key words: *Cymbopogon schoenanthus*, phytochemical screening, chemical composition and oil yield.

INTRODUCTION

Camel grass, *Cymbopogon schoenanthus* Spreng. (Syn: *Andropogon schoenanthus*) has been known since early times and has found numerous applications for costumes and medicinal purposes. In the older pharmacopoeias and herb, it is mentioned as *Herba schoenanthus*. However, other names were also used, such as *Ucus odoratus* and Fosnums or palea came-loruin, the common Arabic name is Izkhir [1]. As a characteristic desert plant, it occurs throughout North Africa and Arabia. In Nigeria, *Cymbopogon schoenanthus* known as “tsabre” grass is found growing in Sokoto state, North Western Nigeria. It also occurs in the Persian province, Kiman, where it is found at altitudes 2000m and more. Furthermore, it is found in south Afganistan and Northwest Beluchistar as far as the Punjab. In the desert, it is the principal food for camels. It is common throughout N. Africa, the orient and India occasionally recorded in Mali, Niger, Nigeria and Ghana [8]

Camel grass is a compact tufted perennial grass with culms 60-90cm high. It grows on dry stony ground of sub-desert requiring minimum amount of water [5]. All parts of the plant are aromatic, [2]. The plant has some similar features and importance with lemongrass. [8] reported mortality of mosquito larvae treated with camel grass oil.
Available literature indicates insecticidal potential as part of the economic importance of camel grass but no study has been carried out on the locally available species in Sokoto to assess their phytochemical and chemical constituents. There is therefore, the need to carry out a study to determine the constituent present in the extracted oil.

The study was aimed at screening the phytochemical composition of *C. schoenanthus*. The specific objectives were to determine the phytochemical composition of the leaf extracts of *C. schoenantus* and to evaluate the oil yield and chemical composition.

MATERIALS AND METHODS

Collection of Samples

Samples of camel grass were obtained from Main Campus of Usmanu Danfodiyo University, Sokoto. The species was authenticated by comparison with preserved specimen in the University herbarium, Sokoto.

Preparation and phytochemical screening of the grass material

The grass sample was dried under shade. The sample was then pulverized into a fine powder using mortar and pestle. The powder was sieved using 80 (µm) laboratory sieves and then kept in a dried polythene bag for subsequent screening of chemical constituents. Qualitative and quantitative screening of phytochemical in the grass powder was conducted in the Biochemistry Laboratory, Usmanu Danfodiyo University, Sokoto. In quantitative test, the methods of [6], [11] and [4] were employed. The extracts were evaluated qualitatively for the presence of alkaloids, anthraquinones, balsams, cardiac glycosides, flavonoids, glycosides, saponin, saponin glycosides, steroids, tannins and volatile oil.

Alkaloids

Two milliliters (2ml) of extract of the grass species was stirred with 2ml of 10% aqueous hydrochloride acid. For Mayer's reagent, one milliliter (1ml) of the filtrate was treated with few drops of the reagent. Appearance of creamy precipitate indicated the presence of alkaloids in the extract and for Wagner's reagent, one milliliter (1ml) of the filtrate was treated with few drops of the reagent. A reddish brown precipitate also indicated the presence of alkaloids in the extract.

Anthraquinone

Five grams (5g) of the grass powdered was shaken with 10ml benzene, and 5ml of 10% ammonia solution was added to the filtrate. The mixture was shaken. A pink, red or violet color indicated the presence of Anthraquinone, glycoside derivative.

Balsams

Two milliliter (2ml) extract was mixed with equal volume of 90% ethanol. Two drops of alcoholic ferric chloride solution was added to the mixture. A dark green color was observed showing the presence of balsams.

Cardiac Glycosides

To 1ml of grass extract, 2ml of 3.5% ferric chloride solution was added and allowed to stand for 1 minute. 1ml of concentrated sulphuric acid (H_2SO_4) was carefully poured down the wall of the tube so as to form a lower layer. A reddish brown ring at the interface with the upper layer turning green to blue indicated the presence of 2-deoxy sugar containing cardiac glycosides.

Flavonoids

Three milliliters (3ml) aliquot of the filtrate was made alkaline with sodium hydroxide (NaOH). A yellow color developed which indicated the possible presence of flavonoids compounds.

Glycosides

Two and half milliliter (2½ ml) of 50% H_2SO_4 was added to $5cm^3$ of the extracts in a test tube. The mixture was heated in boiling water for 15 minutes. It was then cooled and neutralized with 10% NaOH, 5ml of Fehling's solution was added and the mixture was boiled. A brick red precipitate was observed which indicated the presence of glycosides.

Saponins

Two grams (2g) of the powdered extract was placed into a test-tube, 5ml of water was added and it was shaken strongly. The whole tube was added and it was filled which last for some minute. The presence of bubbles indicated presence of saponin.

Saponin Glycosides
To 2.5ml of the extract, 2.5ml of Fehling's solution A and B were added. A bluish green precipitate showed the presence of saponin glycosides.

Steroids
Five gram (5g) of the grass powder was dissolved in 5ml of Chloroform. It was then filtered. Two milliliter of conc. Sulphuric acid was carefully added to form lower layer. A reddish brown color at the interface indicates the presence of steroidal ring.

Tannins
Five per cent Ferric Chloride solution were added drop by drop to 2-3ml of the extract. A dark green colored precipitate indicates the presences of tannins.

Volatile Oils
One milliliter (1ml) of the extract was mixed with dilute Hydrochloric acid (diluted HCl). A white precipitated was formed which indicated the presences of volatile oils.

Extraction of oil from the leaf powder of the grass species
For the grass species, soxhlet extraction method was applied. Forty five grams (45g) of dried grass powder was weighed. One hundred (100ml) of petroleum ether was used. The oil extracted of camel grass was separately collected in glass bottles. It was then allowed to cool in desiccators for 15 minutes.

Gas Chromatography-Mass Spectroscopy (GC-MS) Analysis
Analysis was performed using GC-MS-QP2010 plus (Shimadzu, Japan) equipped with flame ionization detector (FID). The injection was conducted in split less mode at 250^0C for 3 minutes by using an inlet of 0.75mm ionization detector to minimize peak broadening. Chromatographic separations were performed by using DB-WAX analytical column 30m 0.25mm, 0.25mm (J&W Folsom C.A) with Helium as carrier gas at a constant flow rate of 0.8 ml/min. MS operate conditions (election impact ionization mode) were an ion source temperature of 200^0C, ionization voltage of 70 ev and mass scan range of m/z 23-450 at 2.76 scans/s.

Identification and Quantification of Volatile Compounds
Approximate quantification of volatile compounds was estimated by the integration of peaks on the total iron chromatography using X caliber software (Vienna, Ve). The results are presented as the peak area normalized (%).

RESULTS

The oil obtained had a characteristic pungent smell of ginger. The result showed that in camel grass; saponins, saponin glycosides, and tannins were found in larger quantity compared to alkaloids, cardiac glycosides, flavonoids, and volatile oil which occurred moderately. Balsams were found in trace quantity (Table 1).

Table 1: Phytochemicals detected in *Cymbopogon schoenanthus*

S/N	Compounds	*C. schoenanthus*
1	Alkanoids-wagners reagents	++
	- mayers	++
2	Anthraquinones	N.D
3	Balsams	+
4	Cardiac glycosides	++
5	Flavonoids	++
6	Glycosides	+
7	Saponin	+++
8	Saponin glycosides	+++
9	Steroids	+++
10	Tannins	+++
11	Volatile oils	++

***Keys**: +++ = present in large amount, + = present in trace amount, ++ = present in moderate amount, N.D = Not Detected*

Extraction process showed that in each 45g of the pulverized grass sample, 2.90g (6.44%) of the constituent was oil. The amount, colour and scent of the oil obtained from the grass samples are shown in table 2. Analysis of the

chemical composition of the extracted oil from the grass species revealed sixteen (16) chemical constituents as shown in table 3. Octane was the dominant compound with 40.38%.

Table 2: **Oil yield and physical properties of the oil extracted from the leaves of *Cymbopogon schoenanthus***

Parameter determined	*C. schoenanthus*
Weight of sample used (g)	45.00
Weight of oil extracted (g)	2.90
Volume of oil extracted (ml)	8.70
Percentage of oil (%)	6.44
Color	Dark green
Scent	Ginger

Table 3: **Percentage composition of chemical constituents in *C. schoenanthus* (Camel grass)**

S/N	RT^{-1}(min)	Chemical compound	Peak area (%)
1	3.84	Octane	40.38
2	4.47	Cyclohexane	15.18
3	9.67	Decane	1.96
4	13.10	Trans-p-Mentha-2,8-dienol	4.87
5	13.51	2-Cyclohexen-1-ol	1.56
6	15.17	Cyclohexanol	4.90
7	16.28	Cyclohexanol	5.72
8	17.70	7-Oxabicyclo 4,2, heptanes	2.33
9	18.97	Tridecane	1.62
10	18.98	Tridecane	1.62
11	21.59	Tetradecane	1.28
12	22.80	Dodecane	0.58
13	27.62	n-Hexadecanoic acid	1.62
14	28.75	9,12-Octadecadienoic acid	2.08
15	31.68	Ergost-2,5-ene-3,5,6,12-tetrol	3.46
16	33.03	Octadecanal	11.98

***Keys**: RT^{-1} =Retention time on W.BX Column in GC-MS.*

DISCUSSION

The presences of ten (10) phytochemical constituents in the grass powder of *C. schoenanthus* and up to sixteen (16) different compounds detected in the extracted oil indicate a grass that is rich in chemical constituents. The high presence of saponins, saponin glycosides, steroids and tannins may be a rationale for the use of the plant in medicine preparations. This is because saponins are active agents with soap like properties [3]. Previous literature by [9], indicate that saponins are produced by plant for defense mechanism. Tannin when present helps in healing of wounds [12] and also has astringent and antimicrobials properties. According to [10], flavonoids are known to protect against allergies, diabetes, inflammations, malaria, platelet aggregations and microbial infection. Accordingly there may be scientific basis for use of camel grass as medicinal aliment in Ghana, Niger and Northern Nigeria. Glycoside was found in trace amount, which is reportedly used for treatment of heart diseases [12]. The high composition of Octane (40%) may be responsible for the insecticidal properties of the grass as indicated by [8]. Iso-octane is used in pesticide preparation [7].

CONCLUSSION

Phytochemical content of camel grass and chemical composition of its oil indicate an herb with good potentials in medicinal applications and pest control.

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