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GC-MS analysis of ethanolic extract of aerial parts of *Cyperus scariosus* R.Br.

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ABSTRACT

Cyperus scariosus R.Br. belongs to family Cyperaceae, distributed in and around rivers, waterfalls and other damp areas throughout India. The extracts of *Cyperus scariosus* have been frequently used as anti-hyperglycemic, hepato-protective, anti-nociceptive, anti-fungal, plant growth regulator, insecticidal and ovicidal agent, among other medicinal purposes. In the present investigation, the ethanolic extract of aerial parts including leaves, flowers and aerial stem of *C. scariosus* was analyzed by gas chromatography-mass spectrometry (GC–MS) to identify the important phytochemical constituents. The GC–MS analysis revealed the presence of 17 phytochemical compounds. The major compounds were identified as 2, 2,6-Trimethyl-4H-1,3-dioxin-4-one (65.73%), Trichloroacetic acid, 4-methylpentyl ester (7.98 %), 3-Methoxy-3-methyl-1-pentene (4.67%), 2-Propenoic acid, 2-(acetylamino)- (3.96%) , 1-Pentanol, 2-methyl- (3.35%) and 4-Dodecanol (3.08%).

Key Words: *Cyperus scariosus,* aerial parts, GC-MS analysis, phytochemical compounds.

INTRODUCTION

Cyperus scariosus R.Br. a perennial, fragile, slender sedge often known as "nagarmotha" or "nutgrass," a member of the family Cyperaceae. It is widespread throughout India and found in wet or marshy environment like near rivers and waterfalls (Nadkarni, 2009; Sharma *et al.* 2017). It is widely dispersed throughout the world's forests and swamps in both tropical and temperate climates (Kasana *et al.* 2013). *C. scariosus* grows fast, covering the soil with a tangle of roots and rhizomes with an angular, soft stem (40–90 cm) and growing to a height of roughly 45–75 cm (Srivastava *et al.* 2014). It contains chemical constituents such as steroids, alkaloids, terpenoids, saponins, gums, lactones, coumarin, essential oils, and esters, among others, making it very desirable for its potential use in a variety of industries (Utreja *et al.* 2015).

It is widely used in conventional medicine, including Ayurveda (Jani and Murthy, 2012; Srivastava *et al.* 2014). The plant has been proved for various pharmacological activities, including antimicrobial (Lahariya and Rao, 1979) antinociceptive, hypoglycemic (Alam *et al.* 2011), hepatoprotective (Gilani and Janbaz, 1995), antidepressant (Ramesh *et al.* 2012), hypolipidemic (Chawda *et al*. 2014), hypotensive and spasmolytic activities (Gilani *et al.* 1994). The rhizomes, which are brown in colour have a folkloric reputation as cordial, tonic, diuretic, diaphoretic, vermifuge, and desiccant (Kirtikar and Basu, 1918; Watt, 1972; Said, 1982). It is widely valued in India for its roots and utilised for many different things, including aromatherapy, perfume, and other things (Arshiya *et al.* 2013).

Gas chromatography-mass spectrometry (GC-MS) has been widely used in recent years to identify a variety of bioactive therapeutic chemicals found in medicinal plants (Fan *et al.* 2018; Satapute *et al.* 2019). It is one of the best, fast and accurate technique to detect a number of compounds, including alcohols, alkaloids, steroids, nitro compounds, long chain hydrocarbons, organic acids, esters and amino acids (Razack *et al.* 2015) and requires a small volume of plant extracts (Konappa *et al.* 2020). Hence, in the present investigation, the GC–MS technique was adopted for detection and identification of phytochemical compounds present in the aerial parts of *C. scariosus*.

MATERIALS AND METHODS

Collection of plant material:

Cyperus scariosus plants aerial parts were collected from the field nearby damp water in Degloor and Dharmabad of Nanded Dist, Maharashtra State.

Preparation of extract:

The aerial parts of *C. scariosus* were washed, shade dried at room temperature. After complete drying, aerial parts were ground to a fine powder using a blender. The powder was extracted with ethanol using a Soxhlet apparatus. After extraction, the ethanol was evaporated and the extract was stored in a refrigerator at 4 °C until used.

Gas Chromatography-Mass Spectrometry (GCMS) analysis:

GC-MS analysis of ethanolic extract of aerial parts of *C. scariosus* was carried out at SAIF Lab, IIT Bombay, with EI- MS spectrum scanned at 70 eV. The relative percentage amount of each constituent was calculated by comparing its average peak area with the total area.

Instrument details

The Agilent 7890 instrument was used for GC, the detector used was Flame Ionization Detector (FID), and the total run time of GC was 1hr.

The Joel Accu Time of Flight Analyzer (TOF) GCV instrument for MS was used, Specification: Mass range of 10-2000 amu and resolution of 6000.

The GC-MS analysis was carried out by split less injection (80-1M-6-200-2M-8-275-5M-5-280-ETHANOL -HP5). The phytochemicals were identified by comparing their MS spectra patterns to the standard mass spectra available at the National Institute of Standards and Technology (NIST) Mass Spectra Database.

RESULT AND DISCUSSION

The results of seventeen total compounds identified in the ethanolic extract of aerial parts of *Cyperus scariosus* are shown in Table 1. The phytocompounds identified were 3-Buten-2-ol (0.38%); 3-[3-Acetyl-4,10a10b-trimethyl-7-(4-methylpentyl)-5,8-dioxo-tetradeca hydro-9-oxapentaleno[2,1-a] naphthalen-(0.48%); 2-Propenoic acid, 2-(acetylamino)-(3.96%); 1-Pentanol, 2-methyl- (3.35%); 4-Dodecanol (3.08%); Oxalic acid, 3,5-difluorophenyl propyl ester (0.28%); 6,10,14-Trimethyl-pentadecan-2-ol, O-trimethylsilyl (0.70%); Oxalic acid, monoamide, N-(4-chlorophenyl)-, heptyl ester (2.70%); 5-(4-Methoxymethylphenyl)-10,15,20-triphenyl-21H,23H-porphine zinc (0.13%); Pentane, 2,2-dimethyl- (0.65%); Butane, 1,1'-oxybis[3-methyl- (0.17%); Trichloroacetic acid, 4-methylpentyl ester (7.98%); 2,2,6-Trimethyl-4H-1,3-dioxin-4-one (65.73%); Octane, 2,7-dimethyl- (1.81%); 3-Methoxy-3-methyl-1-pentene (4.67%); Propanal, butyl hydrazone (2.46%) and 3,5-Heptanedione, 2,4,6-trimethyl (1.39%). Among the identified compounds, 2, 2,6-Trimethyl-4H-1,3-dioxin-4-one (65.73%) was the most abundant compound, whereas 5-(4-Methoxymethylphenyl)-10,15,20-triphenyl-21H,23H-porphine zinc (0.13%) was the least compound found in the extract. The chromatogram of the GC-MS spectral analysis of aerial parts of *C. scariosus* reflecting the peaks of the distinct compounds and their retention times are shown in Fig. 1.

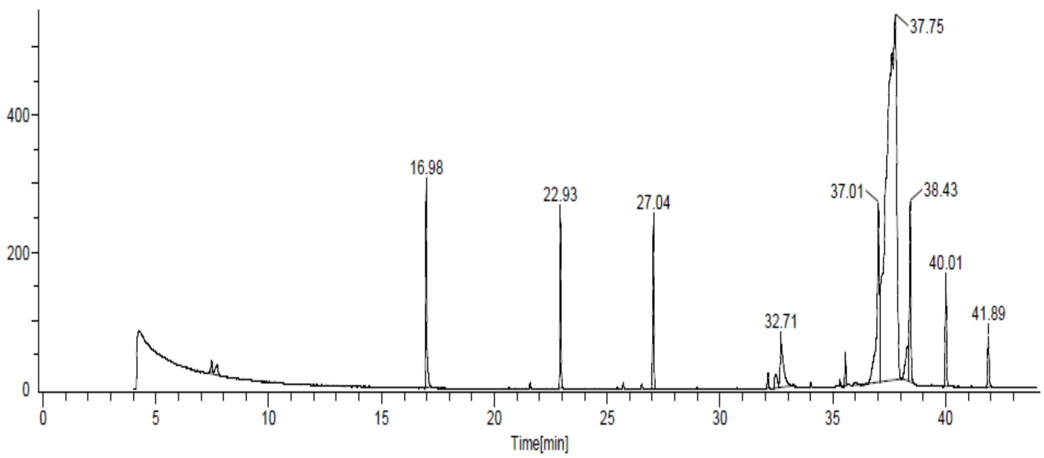

Fig. 1: GC-MS spectrum of the ethanolic extract of aerial parts of *Cyperus scariosus.*

Table 1: GC-MS analysis identified compounds of aerial parts of *Cyperus scariosus*.

Sr No.	Compound name	Molecular formula	Molecular weight	RT (min)	Peak area (%)
1	3-Buten-2-ol	C_4H_8O	72	7.46	0.38
2	3-[3-Acetyl-4,10a,10b-trimethyl-7-(4-methylpentyl)-5,8-dioxotetradecahydro-9-oxapentaleno[2,1-a]naphthalen-	$C_{30}H_{46}O_6$	502	7.72	0.48
3	2-Propenoic acid, 2-(acetylamino)-	$C_5H_7NO_3$	129	16.98	**3.96**
4	1-Pentanol, 2-methyl-	$C_6H_{14}O$	102	22.93	**3.35**
5	4-Dodecanol	$C_{12}H_{26}O$	186	27.04	**3.08**
6	Oxalic acid, 3,5-difluorophenyl propyl ester	$C_{11}H_{10}F_2O_4$	244	32.12	0.28
7	6,10,14-Trimethyl-pentadecan-2-ol,O-trimethylsilyl	$C_{21}H_{46}OSi$	342	32.45	0.70
8	Oxalic acid, monoamide, N-(4-chlorophenyl)-, heptyl ester	$C_{15}H_{20}ClNO_3$	297	32.70	2.70
9	5-(4-Methoxymethylphenyl)-10,15,20-triphenyl-21H,23H-porphine zinc	$C_{46}H_{32}N_4OZn$	720	35.31	0.13
10	Pentane, 2,2-dimethyl-	C_7H_{16}	100	35.55	0.65
11	Butane, 1,1'-oxybis[3-methyl-	$C_{10}H_{22}O$	158	35.98	0.17
12	Trichloroacetic acid, 4-methylpentyl ester	$C_8H_{13}Cl_3O_2$	246	37.01	**7.98**
13	2,2,6-Trimethyl-4H-1,3-dioxin-4-one	$C_7H_{10}O_3$	142	37.75	**65.73**
14	Octane, 2,7-dimethyl-	$C_{10}H_{22}$	142	38.31	1.81
15	3-Methoxy-3-methyl-1-pentene	$C_7H_{14}O$	114	38.42	**4.67**
16	Propanal, butylhydrazone	$C_7H_{16}N_2$	128	40.01	2.46
17	3,5-Heptanedione, 2,4,6-trimethyl	$C_{10}H_{18}O_2$	170	41.89	1.39

The tribal and rural population in India frequently using the local plant's crude extract for medicinal and other purposes. Crude extracts and medicines manufactured on the principles of natural compounds, even by pharmaceutical companies, may lead to large-scale human exposure to natural products. The biological and phytochemical evaluation of plant extracts from conventional popular medicine preparations is the first step towards achieving this goal (Paz *et al.* 1995; Rishikesh *et al.* 2012).

One of the first stage is to conduct a GC-MS analysis for understanding the nature of active principles in medicinal plants and determining whether a plant species possesses a certain component or group of compounds (Kavitha, 2021). The spectrum profile of GC-MS confirmed the presence of the chief constituents and their retention time. The peak heights indicate the relative concentrations of the constituents present in the extracts. In comparison of the mass spectra of the constituents with the NIST library, the phytoconstituents were characterized and identified.

CONCLUSION

In the present study, the identified phytocompounds of *C. scariosus* with their molecular formula and structure could be used to develop drugs. Due to its bioactive components, which were detected by GC-MS analysis, this study may also improve the way *C. scariosus* is currently used. The pharmacological action of a certain *C. scariosus* chemical needs more research, which could result in the creation of a new medication for the treatment of a particular ailment. The pharmaceutical industry's research on pharmacology and the creation of new drugs will both benefit from this study. The findings suggest that *C. scariosus* aerial parts contain a variety of bioactive substances.

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CONFLICT OF INTEREST
Authors declare that there is no conflict of interest.

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