Open Access Contents
Int. J. Drug Dev. & Res.
| April - June 2014 | Vol. 6 | Issue 2 | ISSN 0975-9344 |
www.ijddr.in

Full Length Original Research Paper

Chemical Constituents of the Essential oil of *Cyperus rotundus* Linn.

Tiwari Richa*

Kumar Suneet

Department of Pharmacy, Ram-Eesh Institute of Vocational and Technical Education, Department of Pharmacognosy, Knowledge Park-1, Kasna Road, Greater Noida, Gautambudh Nagar, Uttar Pradesh, India. (201310)

Corresponding Authors:
Tiwari Richa
richa_joshi2005@yahoo.co.in

Abstract:
The essential oil obtained by hydrodistillation of rhizomes of *Cyperus rotundus* L.(Nutgrass) was analyzed by GC-MS analysis of oil. Ninety eight components of *Cyperus rotundus* representing 78.4% of the oil were identified. The main constituents in the essential oil were cyperene (9.76%), humulen (7.97%), β- selinene (7.88%), zierone (4.62%), campholenic aldehyde (3.83%), α.-pinene (3.51%), longiverbenone (2.72%), β.-vatirenene (2.32%), copaene (1.79%), limonene (1.45%)

Keywords: *Cyperus rotundus.*, Cyperaceae; essential oil composition, cyperene, α-selinene, α-pinene, β-pinene, myrtenol.

Introduction

Cyperus rotundus L., (family Cyperaceae), also known as purple nutsedge or nutgrass, is a common perennial weed with slender, scaly creeping rhizomes, bulbous at the base and arising singly from the tubers which are about 1-3 cm long. The tubers are externally blackish in colour and reddish white inside, with a characteristic odour. The stems grow about 25 cm tall and the leaves are linear, dark green and grooved on the upper surface. Inflorescences are small, with 2-4 bracts, consisting of tiny flowers with a red-brown husk. The nut is three-angled, oblong-ovate, yellow in colour and black when ripe. *Cyperus. rotundus* is indigenous to India, but is now found in tropical, subtropical and temperateregions.[1-2]

Cyperaceae are the third largest mono-cotyledonous family.[3] and constitute a specialized group of plants, particularly in relation to their generative structure.[4] The majority of the species of Cyperaceae are anemophilous and their flowers generally have no scent because of their tiny, inconspicuous flowers and hidden or reduced perianth.[5]

Cypeus is a large genus of about 600 species of Cyperaceae (sedge family).[6] This genus is characterized by the presence of quinines, flavonoids and sesquiterpenes.

Cyperus rotundus is a multipurpose plant, widely used in traditional medicine around the world to treat stomach ailments, wounds, boils and blisters.[7-10] A number of pharmacological and biological activities including anti-*candida*, anti-inflammatory, antidiabetic, antidiarrhoeal, cytoprotective, antimutagenic, antimicrobial, antibacterial, antioxidant, cytotoxic and apoptotic, anti-pyretic and analgesic activities have been reported for this plant.[11-16] Previous phytochemical studies on *Cyperus rotundus* revealed the presence of alkaloids, flavonoids, tannins, starch, glycosides and many novel sesquiterpenoids.[17-19]

The present study was undertaken in order to determine the qualitative composition of essential oil of *Cyperus rotundus.*

Material and methods

The plant material was collected from Khari Baoli, local market of New Delhi, in the month of August. The plant was identified as *Cyperus rotundus* (Cyperaceae) by Dr. H.B. Singh (Head) Raw Materials Herbarium & Museum (RHMD), National Institute of Science Communication and Information Resources (NISCAIR), near Pusa Gate, New Delhi. A voucher specimen (Specimen No: NISCAIR/RHMD/Consult/-2011-12/1801/101) is preserved in herbarium section of taxonomic department of NISCAIR, New Delhi.

Isolation

The rhizome of plant after grinding had been submitted to hydrodistillation with a Clevenger type apparatus according to the standard procedure described in the British Pharmacopoeia.[20] The rhizome was added to distilled deionized water (1.5 L) in a 2-5 L round bottomed flask and heated to boiling for 4hour, after which the essential oil was evaporated together with water vapour and finally collected in a condenser. The upper phase that contained the essential oil was separated from the lower one and the distillate isolated was preserved in a sealed sample tube and stored under refrigeration until analysis.

GC-MS analysis and identification of compounds

GC-MS analysis of the oils were performed on a GC- MS QP2010 Plus (SHIMADZU) Gas chromatography mass spectrometer system equipped with a Omegawax™ 250 Flused silica capillary column. The oven temperature was programmed from 100°C and injection temperature was 270°C. The column flow rate 1.21 ml/min. The ion source was set at 230 °C. Helium was used as the carrier gas at a flow rate of 1 ml/min. Scanning speed 1250 and 1.0 µL of diluted oil in chloroform was injected into the GC/MS.

Result and Discussion

Table 1 shows the constituents of the essential oil, their percentage composition listed in order of elution. Ninety-eight constituents, representing 78.4% of the total components in the oil of *Cyperus rotundus* were characterized. The major constituent found in essential oil was cyperene (9.76%). Other important constituent in essential oil were Humulen (7.97%) and β- Selinene (7.88%). In addition the oil had significant amount of Zierone (4.62), Campholenic Aldehyde (3.83%), α.-Pinene (3.51%), Longiverbenone (2.72%), β.-Vatirenene (2.32%), Copaene (1.79%), Limonene (1.45%), Terpineol (1.55%), Azulene (1.35%), α.-Selinene (1.29%), Myrtenol (1.25%), Calacorene (1.66%), Fokienol (1.14%) and Isogermacrene D (1.17%), Isolongifolene (1.04%).The content of remaining compounds was relatively low in the essential oil and were present in the range from 0.1-0.98%.

Table 1: Percentage compostion of the oil of *Cyperus rotudus* L

Compounds*	R. Time	Area%
α.-pinene	2.516	2.51
α.-fenchene	2.786	0.07
Camphene	2.861	0.27
β-pinene	3.240	0.97
thuja-2,4(10)-diene	3.386	0.21
alpha. Terpinene	4.039	0.09
Limonene	4.310	1.45

Covered in Scopus & Embase, Elsevier Int. J. Drug Dev. & Res., April - June 2014, 6 (2): 57-60

Eucalyptol	4.460	0.11
2,6-dimethyl-1,3,5,7-octatetraene	4.534	0.15
gamma-terpinene	5.009	0.07
Cymene	5.431	0.49
Terpinolene	5.653	0.40
Artemiseole	6.385	0.59
Styrene	8.755	0.68
Naphthalenone	8.986	0.21
Furfural	9.219	0.08
Sativen	9.958	0.12
Copaene	10.171	1.79
aristola-1(10),8-diene	10.332	0.59
pino camphone	10.590	0.32
Cyperene	11.035	9.76
Aromadendrene	11.284	0.27
Pinocarvone	11.727	0.22
Nopinone	11.965	0.33
Elemene	12.036	0.64
Carvone	12.651	0.12
aristola-1(10),8-diene	12.802	0.33
Naphthalenone	12.883	0.17
Myrtenal	13.078	0.64
campholenic aldehyde	13.518	3.83
Cadinene	13.893	0.14
Chamigrene	14.253	0.72
Naphthalene	14.371	0.21
Terpineol	14.508	1.55
Verbenone	14.819	0.53
Azulene	15.157	1.35
β-selinene	15.296	7.88
α.-selinene	15.367	1.29
Isolongifolene	15.599	1.04
β.-vatirenene	15.774	2.32
Cadinene	16.028	0.86
α- maaliene	16.188	0.25
Guaiene	16.437	0.14
Myrtenol	16.545	1.25
1,8-nonadiene	16.872	0.17
beta.-vatirenene	17.015	0.19
aristola-1(10)	17.107	0.40
eremophila-1(10)	17.274	0.54
isogermacrene d	17.344	1.17
Carveol	17.461	0.09
Calamenene	17.647	1.31
Andrographolide	18.210	0.12
Isospathulenol	18.358	0.11
Isolongifolene	19.066	0.14
Calacorene	19.364	1.66
caryophyllene oxide	19.613	0.13
Neoisolongifolene	20.333	0.12
4-boraperhydroindane	20.945	0.68
4-ethylguaiacol	21.474	0.72
humulene epoxide ii	21.865	0.84
sesquisabinene hydrate	22.262	0.22
5,16-pregnadiene	22.497	0.36
Bulnesene	22.581	0.24
cumin alcohol	22.826	0.12
isoaromadendrene epoxide	23.148	0.15
z-jasmone	23.527	0.04
Intermedeol	23.661	0.11
Isolongifolene	23.794	0.07
cis-z-.alpha.-bisabolene epoxide	23.958	0.08
Zierone	24.057	0.31
5-isopropylidene-4,	24.555	0.26
p-vinylguaiacol	24.646	0.27
Globulol	24.976	0.24
dihydro-neoclovene-(ii)	25.089	0.17
Cadalene	25.305	0.23
alloaromadendrene oxide-(2)	25.533	0.84
Longiverbenone	25.923	2.72
Zierone	26.263	4.62
caryophyllene oxide	26.546	0.83
Duvatriendiol	26.647	0.94
2(3h)-naphthalenone	26.840	0.69
Viridiflorol	27.299	1.03
longipinane, (e)	27.495	0.37
humulen-(v1)	27.715	7.97
Azulene	27.936	0.57
Fokienol	28.138	1.14
kaur-16-ene	28.232	0.65
Dehydroaromadendrene	28.434	0.26
4,8-dimethyl-nona-3,8-dien-2-one	28.933	0.19
cis-z-.alpha.-bisabolene epoxide	29.156	0.47
1-heptatriacontanol	29.397	0.49
1,3,6,10-cyclotetradecatetraene	29.716	0.95
Biphenylene	30.628	0.38
dodecanoic acid	30.946	0.42
2(3h)-furanone	31.534	0.11
Nootkatone	31.903	0.28
kauran-18-al	32.582	0.55
n-hexadecoic acid	40.995	0.33

References

1) Pooley, E. (1998). A Field Guide to Wild Flowers in KwaZulu-Natal and Eastern Region; Natal Flora Publications Trust; Durban, South Africa, pp. 562.

2) Gordon-Gray, K.D. (1995). *Cyperaceae* in Natal, National Botanical Institute, Pretoria, South Africa, pp. 45-76.

3) Muasya, A.M., Simpson, D.A., Chase, M.W., and Culham, A. (1988). An assessment of suprageneric phylogeny in Cyperaceae using rcbL DNA sesquences. Plant Syst. Evol. 211: 257-271.

4) Kulkonen, I. (1994). Definition of descriptive terms for the Cyperaceae. Ann. Bot. Fenn. 31: 37-43.

5) Guarise, N.J. and Vegetti, A.C.(2008). Processes responsible of the stricture diversity of the Cyperaceae synfloresence: Hypothetical evotionary trends. Flora 203: 640-647.

6) Riddle, J.M. (1992). Contraception and Abortion from the Ancient World to the Renaissance. Harvard University Press, Cambridge.

7) Oliver-Bever, B. (1986). Medicinal Plants in Tropical West Africa, Cambridge University Press, Cambridge, UK, pp. 200.

8) Puratuchikody, A.; Nithya, D.C.; Nagalakshmi, G. (2006). Wound Healing Activity of *Cyperus rotundus* Linn. Indian J. Pharm. Sci., 68: 97-101.

9) Joshi, A.R.; Joshi, K. (2000). Indigenous knowledge and uses of medicinal plants by local communities of the Kali Gandaki Watershed Area, Nepal. J. Ethnopharmacol., 73: 175-183.

10) El-Kamali, H.H.; El-Khalifa, K.F. (1999). Folk medicinal plants of riverside forests of the Southern Blue Nile district, Sudan. Fitoterapia., 70: 493-497.

11) Durate, M.C.T.; Figueira, G.M.; Sartoratto, A.; Rehder, V.L.G.; Delarmelina, C. (2005). Anti-Candida activity of Brazilian medicinal plant. J. Ethnopharmacol., 97: 305-311.

12) Raut, N.A.; Gaikwad, N.J. (2006). Antidiabetic activity of hydro-ethanolic extract of *Cyperus rotundus* in alloxan induced diabetes in rats. Fitoterapia., 77: 585–588.

13) Uddin, S.J.; Mondal, K.; Shilpi, J.A.; Rahman, M.T.(2006). Antidiarrhoeal activity of *Cyperus rotundus*. Fitoterapia., 77: 134–136.

14) Kilani, S.; Ben Ammar, R.; Bouhlel, I.; Abdelwahed, A.; Hayder, N.; Mahmoud, A.; Ghedira, K.; Chekir-Ghedira, L. (2005). Investigation of extracts from (Tunisian) *Cyperus rotundus* as antimutagens and radical scavengers. Environ. Toxicol. Pharmacol., 20: 478-484.

15) Zhu, M.; Luk, H.H.; Fung, H.S.; Luk, C.T. (1997). Cytoprotective effects of *Cyperus rotundus* against ethanol induced gastric ulceration in rats. Phytother. Res.,11: 392 -394.

16) Biradar Sandeep, Kangalkar, V.A., Mandavkar Yuvaraj, Thakur Megha, Chougule Nilesh., (2010). Antiinflammatory, antiarthritic, analgesic, anticonvulsant activity of cyperus rotundus essentional oils. Inter. Jour. of Pharmacy and Pharmaceutical Sciences., 112-115.

17) EL-Habashy, I..; Mansour, R.M.A.; Zahran, M.A.; EL-Hadid, M.M.; Saleh, N.A. (1989). Leaf flavonoids of *Cyperus* species in Egypt. Bio. Syst. Ecol., 17: 191-195

18) Umerie, S.C.; Ezeuzo, H.O. (2000). Physicochemical characterization and utilization of *Cyperus rotundus* starch. Bioresour. Technol., 72: 193-196.

19) Rai Puneet Kumar, Kumar Rajesh, Malhotra Yogender, Sharma Dharmesh, Karthiyagini, T., (2010). Standardization and preliminary phytochemical investigation on Cyperus rotundus L. rhizome. Inter. Jour. Research in Ayuv. & Pharmacy., 536-542.

20) British Pharmacopoeia Part II (1988). HMSO, London. 109-110.

Article History: ----------

Date of Submission: 29-04-2014

Date of Acceptance: 26-05-2014

Conflict of Interest: NIL

Source of Support: NONE