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

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**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 temperate regions.1-2

Cyperaceae are the third largest monocotyledonous 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 amelobious 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, antiarrhoeal, 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. The rhizome was added to distilled deionized water (1.5 L) in a 2-5 L round bottomed flask and heated to boiling for 4 hour, 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%), Copaeine (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 composition of the oil of *Cyperus rotundus* L

<table>
<thead>
<tr>
<th>Compounds*</th>
<th>R. Time</th>
<th>Area%</th>
</tr>
</thead>
<tbody>
<tr>
<td>α.-pinene</td>
<td>2.516</td>
<td>2.51</td>
</tr>
<tr>
<td>α.-fenchene</td>
<td>2.786</td>
<td>0.07</td>
</tr>
<tr>
<td>Camphene</td>
<td>2.861</td>
<td>0.27</td>
</tr>
<tr>
<td>β.-pinene</td>
<td>3.240</td>
<td>0.97</td>
</tr>
<tr>
<td>thuja-2,4(10)-diene</td>
<td>3.386</td>
<td>0.21</td>
</tr>
<tr>
<td>alpha. Terpinene</td>
<td>4.039</td>
<td>0.09</td>
</tr>
<tr>
<td>Limonene</td>
<td>4.310</td>
<td>1.45</td>
</tr>
</tbody>
</table>
Eucalyptol & 4.460 & 0.11 \\
2,6-dimethyl-1,3,5,7-octatetraene & 4.534 & 0.15 \\
gamma-terpinene & 5.009 & 0.07 \\
Cymene & 5.231 & 0.49 \\
Terpinolene & 5.653 & 0.40 \\
Artemisiole & 6.385 & 0.59 \\
Sterene & 8.755 & 0.68 \\
Naphthalenone & 8.986 & 0.21 \\
Furural & 9.219 & 0.08 \\
Salvigen & 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 \\
Aromadiene & 11.284 & 0.27 \\
Pinocarvone & 11.727 & 0.22 \\
Nopinine & 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 & 0.14 \\
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 \\
a-selinene & 15.367 & 1.29 \\
isolongifolene & 15.599 & 1.04 \\
B-β-verdenene & 15.774 & 2.32 \\
Cadinene & 16.028 & 0.86 \\
a-α-maileene & 16.188 & 0.25 \\
Guaiene & 16.437 & 0.14 \\
Myrtenol & 16.545 & 1.25 \\
1,8-nonadiene & 16.872 & 0.17 \\
beta-β-verdenene & 17.015 & 0.19 \\
aristola-1(10) & 17.107 & 0.40 \\
eremphila-1(10) & 17.274 & 0.54 \\
isogeramarine d & 17.344 & 1.17 \\
Carveol & 17.461 & 0.09 \\
Calamenene & 17.647 & 1.31 \\
Andrographolide & 18.210 & 0.12 \\
isopathulenol & 18.358 & 0.11 \\
isolongifolene & 19.066 & 0.14 \\
Calacorene & 19.364 & 1.66 \\
caryophyllene oxide & 19.613 & 0.13 \\
Neolongifolene & 20.333 & 0.12 \\
4-boraperydroindane & 20.945 & 0.68 \\
4-ethylguaiacol & 21.474 & 0.72 \\
humulenepoxide ii & 21.865 & 0.84 \\
sequisabinene hydrate & 22.262 & 0.22 \\
5.16-pregnadiene & 22.497 & 0.36 \\
Bulnesene & 22.581 & 0.24 \\
cumin alcohol & 22.826 & 0.12 \\
isooromadendrene epoxide & 23.148 & 0.15 \\
z-jasmone & 23.527 & 0.04 \\
Intermedeol & 23.661 & 0.14 \\
isolongifolene & 23.794 & 0.07 \\
cis-z-alpha-bisabolene epoxide & 23.958 & 0.08 \\
Zierone & 24.057 & 0.31 \\
5-isopropylidene-4, p-vinylguaiacol & 24.555 & 0.26 \\
Globulol & 24.646 & 0.27 \\
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 & 26.566 & 0.83 \\
Duvatiendiol & 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 & 0.79 \\
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 \\
Biphethylene & 30.628 & 0.38 \\
dodecanolic acid & 30.946 & 0.42 \\
2(3h)-furaneone & 31.534 & 0.11 \\
Noolkateone & 31.903 & 0.28 \\
kauran-18-al & 32.582 & 0.55 \\
n-hexadecenoic acid & 40.995 & 0.33 \\


References


